ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: EI-27001 SUBJECT NOMENCLATURE: CIRCUIT ANALYSIS AND SYNTHESIS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of basic Electrical engineering

Course Outcomes:-

CO1: Discussed and enhanced the knowledge about circuit's analysis and synthesis by applying KVL and KCL.

CO2: Identify the circuit's topology to reduce complexity.

CO3: Apply the knowledge of Fourier series and Laplace Transform for circuit analysis.

CO4: Determine the solutions for differential equations for circuit analysis.

CO5: Understanding the concept of transient and steady state response of electrical circuits. Also the knowledge about Applicability of Foster and Cauer forms.

Course Content:

Theory:

UNIT-1: Basics of electrical Networks

Network elements: E.M.F., Potential and Potential difference, Current and Current density, Ideal and practical Voltage and Current Source and their characteristics, source transformations, Various network elements and their behaviour, Power and energy relations, Kirchhoff's laws, Current and voltage division, Nodal and Mesh analysis, Graph theory, Incidence and Reduced incidence matrix, isomorphic graph, Tie-set and Cut-set matrix.

UNIT-2: Network Theorems & Filter circuits

Superposition, Reciprocity, Thévenin's, Norton's and Maximum power transfer, Compensation, Tellenge's. Δ-Y transformation, Polyphase analysis, Power relation in AC Circuits, Power factor, Apparent and reactive power, Power triangle, Sinusoidal steady state analysis of RLC circuits, Passive filters, High pass and Low pass, Band pass & Band stop filter, Prototype & m-derived filters, Fundaments of active filters.

UNIT-3: Analysis of Coupled Circuits & Resonance

Magnetic coupling, Study of ideal transformer, Time domain, natural response and forced response, Dot convention, electrical equivalent of magnetically coupled circuits, single and double tuned coupled circuits, Resonance: Series and parallel resonance, bandwidth &selectivity, Q-factor, Effect of resistance on frequency response curve, Parallel resonance of RLC circuit.

UNIT-4: Two port network analysis & Network Functions

Various network parameters: Z, Y, Hybrid, ABCD & their relationships condition of reciprocity and symmetry, Input and output impedances, Equivalent T and Π sections representation in parameter form, Ladder network, Network Function, Driving point and transfer impedances, Interpretation of poles and zeros, effect of their location in complex plane. Routh-Hurwitz Criterion of stability.

UNIT-5: Time Domain Analysis of Circuits and Concept of Network Synthesis

Transient and steady state response of electrical circuits, Initial conditions & final condition, step and impulse response, Network Synthesis: Hurwitz polynomial, Positive Real (PR) function, Properties of LC, RC, RL immittances, Foster realization of LC circuits, Ladder development and Cauer forms, Significance of elements in Foster & Cauer forms, Determination of end elements, Applicability of Foster and Cauer forms.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizingSeminars/Quizs and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Practicals:

List of Experiments:

1. To study and verify Kirchhoff‘s Current Law and Kirchhoff‘s Voltage Law.
2. To Implement and verify Thevenin‘s theorem.
3. To Implement and verify Norton‘s theorem.
4. To Study and verify Superposition theorem.
5. To Study and verify Reciprocity theorem.
6. To verify Maximum Power Transfer theorem.
7. To study Integrator and Differentiator circuits and observe the input/output waveforms.
8. To verify frequency response of series R-L-C circuit and determine resonance frequency.
9. To Study frequency response of parallel R-L-C circuit and determine resonance frequency.
10. To Study series R-L-C circuit with step input for under damped, over damped and critical damped case.

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

Text Books:

1. John D. Ryder & Charles M. Thomson Electronic Circuits & Systems Prentice-Hall Inc. 1976
2. Van Valkenburg M.E., Network Analysis, Third Edition, Pearson Education.
3. D. Roy Choudhury, Networks and Systems, New Age International, 1988

Reference Books:

1. Desoer and Kuh, Basic Circuit Theory, McGraw Hill.
2. Franklin F. Kuo Network Analysis & Synthesis Wiley Toppan 2nd.ed. 1966
3. Van Valkenburg M.E., Introduction to Modern Network Synthesis, PHI.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE II Year (4 YDC)
SUBJECT CODE: EI-27002 SUBJECT NOMENCLATURE: FUNDAMENTAL OF MEASUREMENT

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of basic Electronics

Course Outcomes:

CO1: To discuss fundamentals of measuring instruments theoretically as well as practically.
CO2: To determine Cathode ray oscilloscope in detail with its applications and probe compensation.
CO3: Attain basic knowledge about Analog instruments.
CO4: Description of measurement of low resistances, voltage, current, phase frequency etc.
CO5: To implement compensation, calibration and testing of measuring instruments.
CO6: Gain knowledge about A.C. bridges and its applications.

Course content:

Theory:

UNIT-1 Fundamentals of measuring instruments: Fundamental methods of measurement, Classification of measuring instruments, Static and Dynamic characteristics, Error Classification and analysis, Standards for displacement, force, time, frequency, temperature and electrical standards. IEEE standards.

UNIT-2 Cathode Ray Oscilloscope: construction and operation, measurement of amplitude, phase and frequency with CRO, lissajous patterns. Fundamentals of EMI, RF measurements techniques, Network analyzers, Noise reduction techniques, compatibility of measuring instruments.

UNIT-3 Analog Instruments: Analog indicating type instruments based on various operating principles, ammeters, voltmeters, ohmmeters. Extension of instrument range, instrument transformers.

UNIT-4 Measurement of low resistances, voltage, current, phase, frequency, power and energy, Q factor, resistance, noise etc; compensation, calibration and testing of measuring instruments.

UNIT-5 A.C. Bridges: A.C bridges for measurement of inductance, capacitance, Q factor and loss angle, universal impedance bridge. Design aspects. Design aspects of digital Multimeter and panel meters, Distortion and spectrum analysis.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Practical:

List of Experiments:

1. Study of Cathode Ray Oscilloscope (CRO)
2. To measure Amplitude and Frequency of unknown signal using CRO.
3. To measure Phase and Frequency of unknown signal using Lissajous pattern.
4. Study of PMMC Instrument (Analog Ammeter and Voltmeter).
5. To Measure current and voltage in a circuit using Analog Ammeter and Voltmeter respectively
6. To measure medium range resistance using Wheatstone bridge .
7. To find percentage limiting error in the measurement of value of a given resistor and study of colour coding system of resistor for 4 band, 5 band and 6 band.
8. Study of A.C Bridges (Maxwell‘s, Inductance Bridge, Hay‘s Bridge, Anderson‘s Bridge, Owen‘s Bridge, De- Sauty‘s Bridge, Schering‘s Bridge).
9. To measure unknown inductance of a coil using Maxwell‘s Inductance Capacitance Bridge.
10. Study of Digital Storage Oscilloscope.

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

Text Books :

1. A.K. Sawhney, Electrical & Electronic Measurement & Instrumentation.
2. D.S Kumar, ―Measurement Systems: Applications & design‖
3. B.C.Nakra & K.K.Choudhary, ―Instrumentation measurement & analysis‖

Reference Books:

1. W.D. Cooper, Electronic Measurement, Pearson Education
2. Terman& Petit, Electronic Measurement.
3. Carr, Instrumentation, Pearson Education

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: EI-27003 SUBJECT NOMENCLATURE: ELECTRONIC DEVICES AND CIRCUITS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Course Outcomes:

CO1: To determine basic semiconductor theory and types of semiconductors devices.

CO2: To discuss the working principle of diodes and bipolar transistor.

CO3: To apply the modelling of diode, BJT, MOS.

CO4: To discuss fabrication techniques for integrated circuits.

CO 5: To Determine V-I Characteristics of Diode, Transistors and FET

Course content:

Theory:

UNIT-1 Basics of semiconductor devices

Intrinsic & Extrinsic semiconductors, Mobility and Conductivity, Hall effect, E-K diagram, Current Densities, Diffusion, Generation & Recombination of electron-hole pair, Continuity equation, Conductivity Modulation, Mass-action Law, Injected Minority Carrier Charge, p-n junction diode, V-I characteristics & their temperature dependence, Diode resistances, and capacitance, Breakdown diodes, Photodiodes, LEDs, Varacter Diode, Schottky Diode, Tunnel Diode.

UNIT-2 Diode and Transistor circuits

Clippers, Clampers, Clamping theorem, Rectifiers & filters, Model of diode, Bipolar junction transistor (BJT), Potential profile in PNP & NPN structures, Current components, Configurations, Early Effect, Eber‘s Moll Model, Transistor as an amplifier, Biasing & Thermal Stabilization, The Q point stability, Stabilization against variation of I_{CO}, V_{BE}& β, Bias compensation, Millers theorem andits dual, Thermal runway, Schottky and Photo-transistors.

UNIT-3 BJT Modeling and Introduction to FET

Hybrid model, Simplified model, Common emitter with emitter resistor, high i/p impedance circuits, Emitter follower, comparison of CB, CE, CC configuration, Darlington pair, Bootstrapping, Cascode Amplifier, Field effect transistors(FET), JFET, pinch off, V-I Characteristics, Small signal model, MOSFET, Derivation for drain current I_D for E-MOSFET, Threshold voltage and body effect, CS & CD amplifiers, Biasing techniques, FET as VDR,

UNIT-4 MOS Structure and Short channel effect theory

Band diagram for a MOS junction under accumulation, Depletion & inversion, MOS capacitor, C-V of an ideal & non- ideal capacitors, Characterization of MOS capacitors, MOS field effect transistor (MOSFET) V-I characteristics in three regions of operation & equivalent circuit. Short channel MOSFET: Effect of scaling of MOSFET, Short & narrow channel effects on V-I characteristics, Hot electron effect in MOSFET. Modeling of MOS transistor level-I, BISIM3

UNIT-5 Silicon Processing and Introduction to Power electronic devices

Silicon Planar technology, Oxidation, Diffusion, Metallization, Ion-Implantation & chemical vapor deposition, Lithographic process, Typical Bipolar & MOS IC process sequence, Silicon controlled Rectifier, Holding and Latching current, di/dt triggering and other triggering methods & Unijunction Transistor (UJT) and UJT relaxation oscillator.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Practical:

List of Experiment:

1. To study the cathode Ray Oscilloscope and Function Generator and obtain the sinusoidal waveform of some amplitude and frequency.
2. Measure the Peak and RMS value of sine wave obtained in part (a) and their relationship. Repeat this part for triangular and square waveforms.
3. To plot the V-I characteristic of LED and Zener Diode.
4. To find out the cut-in voltage of LED and breakdown voltage of zener diode from V-I characteristic.
5. Determine the semiconductor type from the polarity of Hall voltage, knowing the orientation of all field and current in the experimental arrangement.
6. Calculate the carrier concentration and mobility from the magnitude of the hall voltage and known experimental variable.
7. Plot the input characteristic of BJT in common emitter configuration.
8. To find input impedance, alpha and beta of transistor.
9. Plot the output characteristic of BJT in common emitter configuration.
10. To find output impedance, alpha and beta of transistor.
11. Study of hybrid (H) parameter of transistor.
12. To find the hybrid parameter from input output characteristic of transistor in CE configuration as done in experiment 4 and 5.
13. Plot the static drain characterization of N channel MOSFET.
14. To calculate its various performance parameters.
15. Study of various fabrication techniques of MOS transistor.

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

Text Books :

1. Jacob Millman& Christos C. Halkias Electronic Devices & Circuits McGraw-Hill 1967.
2. Robert L. Boylestad, Electronic devices and Circuits, PHI.
3. Ben G. Streetman, Solid State Electronics Devices, Prentice Hall of India, 5th edition.

Reference Books:

1. S. M. Sze, Physics of Semiconductor Devices, Wiley-Interscience, 1969.
2. Sedra& Smith L, Electronic circuits, McGraw Hill.
3. John D. Ryder, Electronics fundamentals & Applications, PHI.
4. Milliman and Grabel, Microelectronics, TMH.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE II Year (4 YDC)
SUBJECT CODE: MA-27014 SUBJECT NOMENCLATURE: MATHEMATICS-III

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	1	4	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite:

Course Outcomes:

CO1: Learn advance calculus.
CO2: Understand Fourier series, partial differential equation and their applications in Engg.
CO3: Learn Laplace & Fourier transforms & their applications in Electronics circuit analysis, communication & control systems.
CO4: Learns calculus for finite differentiation and its applications.

Course Content:

Theory

UNIT-1. Advance Calculus: Jacobian‘s, Taylor‘s and Maclaurin‘s Series of two variable, Maximaand Minima of functions of two variables. Lagranges Method of undetermined multipliers and their applications. Elementary ideas of multiple integrals, Change of order of Integration, Change of Variables in double integration using Jacobian, Beta and Gamma functions.

UNIT-2. Fourier Series Partial Differential Equations (PDE) : Definition and Derivations, Odd and even functions, Half-Range Series, Change of Scale, Fourier Integral, Numerical Harmonic Analysis. Formation of PDE, PDE of first order and first degree i.e., Pp+Qq = R, Linear Homogeneous Partial Differential Equations of nth order with constant coefficient. Separation of Variables. Application to Vibration of String and Transmission Line Equation. Applications of FT to solution of PDE.

UNIT-3. Laplace and Fourier Transforms: Definition, LT of elementary and periodic functions, properties of LT and transforms of derivatives, Inverse Laplace Transform and its properties. Convolution Theorem. Fourier Transforms, Sine and Cosine Transform, Application of LT to solution for linear differential equations with constant and variable coefficients, Simultaneous differential equations.

UNIT-4. Calculus of Finite Differences: Difference table, Operators E andΔ, Newton‘s forward and backward interpolation formula, Lagrange‘s interpolation formula, differentiation and integration, difference equations with constant coefficients.

UNIT-5. Numerical Method**:** Solution of algebraic & transcendental equation: Newton Raphson method. of simultaneous algebraic equation: Gauss elimination method, and Gauss Seidel method. Numerical solution of partial differential equations: Taylor‘s Picard‘s & Runge-Kutta Method.

Text Books:

1. Paria G, Ordinary Differential Equations with Laplace Transforms, Scholar‘s Publications, Indore.
2. Paria G, A Textbook of Vectors, Scholar‘s Publications, Indore.
3. Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.

References Books:

1. Ashok Ganguly et al., Engineering Mathematics Vol.II, Ramprasad and Sons, Bhopal.
2. Paria G, Partial Differential Equations and Complex Variables, Scholar‘s Publications, Indore
3. Gyan A.K. and G. Paria, A Textbook of Advance Calculus, Mudranika Press Calcutta.
4. Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New-Delhi,2006

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: HU-27005 SUBJECT NOMENCLATURE: ECONOMICS FOR ENGINEERS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	3	-	-	30	70	-	-	100

PRE-REQUISITES: NIL

COURSE OBJECTIVES:-

1. To develop the optimizing skills of technology-use in engineering problems
2. To articulate economic analytical skills so as to contextualize the solutions of engineering problems.
3. To explore the potential of students in economic perspective of engineering professional goals.
4. To make sense of need of entrepreneurship and understand the financial reports of a business.

COURSE OUTCOMES: after completion of course, the students will be able to:

1. Explain economic cyclic flow and Estimate the demand and demand elasticity for a product.
2. Plan the production; choose appropriate production technology (combination of production factors); and estimate feasible range of production.
3. Analyze the production-cost-profit relation and select the suitable project for investment
4. Estimate price and the equilibrium for a firm/organization in different competitive market situations.
5. Review, summarize and compare the financial statements of an accounting entity and able to apply financial ratio technique for financial analysis.
6. Identify the problems, see the opportunity, and ideate the solution to the problems

COURSE CONTENT:

UNIT 1.Nature and scope of economics, Economic cyclic flow, Central Economic problems, macro and micro economics, concept, determinants and law of demand and supply, Elasticity of demand, Equilibrium price, consumer surplus and equilibrium.

UNIT 2. Production, cost and Revenue: Production function, laws of return to variable proportion, Laws of return to scale, cost concepts, cost functions and their inter relation, Revenue Concepts and functions, break- even analysis, Time value of money and Investment analysis- NPV, IRR, ARR and payback period method.

UNIT 3. Pricing and Market: Price determination and firm‘s equilibrium under perfect competition and monopoly, price-output determination under monopolistic competition, kinked demand curve, collusive and non-collusive oligopoly.

UNIT 4. Entrepreneur, entrepreneurship and start-up, characteristics of an entrepreneur, forms of business organization, phases of startup, small medium and large scale enterprise, problems,

opportunities, Design Thinking and Ideation. Business model.

UNIT 5. Accountancy: Accountancy and bookkeeping, GAAP, Assets, Liabilities and Capital, types of accounts, Journal, Ledger, Trial Balance and Financial Statements, Financial Ratio Analysis.

ASSESSMENT: Through End-Sem. Theory Exam, Theory sessionals, Mid-Sem Tests, and Assignments

Books & Reference Recommendation:

1. JhingalM.l., Economics of development and Planning, Vrinda Publication (40th Ed./latest).
2. Ahuja H. L., Advance economic theory, S Chand Publication, (21st Ed./Latest)
3. Riggs, Bedworth and Randhawa, Engineering Economics, Tata McGraw-Hill, (4th Ed./latest)
4. Principles of accountancy, Nirmal Jain,
5. Entrepreneurship by Rajeev Roy, 2nd edition

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE II Year (4 YDC)
SUBJECT CODE: EI-27498 SUBJECT NOMENCLATURE: ELECTRONIC WORKSHOP

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	2	-	-	1	-	CW	END SEM	SW	END SEM	
						-	-	40	60	100

Pre-Requisite: Knowledge of Basic Components

Course Outcomes:

CO1: **To gain knowledge of characteristics of basic electronic component.**
CO2: To apply colour coding scheme for resistance (Band 4, Band 5 & band 6)
CO3: To implement methodology for designing PCB (Etching, Drilling & Soldering)
CO4: **To design an electronics circuit using basic components like BJT,FET, timers, amplifiers etc. .**

Course Content:

Mini Project design based on:

1. Regulated Power Supplies
2. KVL / KCL based circuits
3. Design based on A.C. bridges
4. Designing using various diodes
5. Designing using operational amplifier
6. Design using various logic families & gates.

Practical:

List of Experiment:

1. Introduction and Precautions for the laboratory providing SAFETY to users.
2. Study and Hands-on Tools required in the Laboratory.
3. Briefing about Electronic components for their ON/OFF condition and testing their working status and values.
4. Introduction about soldering process and soldering practice on a general purpose PCB with Soldering Iron, Soldering wire, flux and connecting wires.
5. Design and Implementation of DC power supply unit in working condition on Bread Board.
6. Construction of DC power supply unit on Printed circuit Board
7. Design and Implementation of Minor Project in working condition on Bread Board.
8. Construction of Minor Project in **Working condition** on Printed circuit Board
9. **Industrial Visit.**

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: OE-I SUBJECT NOMENCLATURE: ELCTRONICS SYSTEM DESIGN

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	1	3	-	3	-	CW	END SEM	SW	END SEM	
						50	-	50	-	100

Pre-Requisite: Knowledge of Basics of CRO, Function Generator etc.

Course Outcomes:

CO1: To study basic introduction of electronic hardware systems and provides hands-on training with familiarization.

CO2: To implement the circuits on PCB and test it with CRO, Function generator and multimeter.

CO3: Testing of electronics components.

CO4: soldering practice and assembling of electronics circuits.

Course Content:

Theory:

UNIT-1. Familiarization/Identification of electronic components with specification, Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.]

UNIT-2. Familiarization/Application of testing instruments and commonly used tools. [Multi-meter, Function generator, Power supply, CRO etc.] [Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station etc.]

UNIT-3. Testing of electronic components [Resistor, Capacitor, Diode, Transistor, UJT and JFET using multi-meter.]

UNIT-4. Inter-connection methods and soldering practice. [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general purpose PCB, Crimping]. Printed circuit boards (PCB) [Types, Single sided, Double sided, PTH, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling].

UNIT-5. Assembling of electronic circuit/system on general purpose PCB, test and show the functioning.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 50% of total marks. Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 50% of total marks.

Text Books:

1. A.K. Sawhney, Electrical & Electronic Measurement & Instrumentation.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: EI-27501 SUBJECT NOMENCLATURE: ANALOG ELECTRONICS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: - Network Theory, Basic Electronics and Engineering mathematics
Course Objective: Student should be able to: Analyze and design BJT and FET based amplifier for required frequency specifications. Analyze and design power efficient amplifiers. Improve amplifier performance by varying various parameters and design various frequency generators. Analyze and design amplifiers for various special mathematical operations using integrated circuits. Analyze and design receiver front end circuits.

Course Outcomes
CO1: To discuss the frequency response & gain calculation of single/double stage amplifiers.
CO2: To apply the fundamentals of feedback amplifier & oscillators.
CO3: **To analyse and apply Op-amp fundamentals and Descriptive view of Op-amp IC's**
CO4: **To discuss Tuned RF voltage amplifiers**
CO5: **To describe the role of Multivibrators & Linear Wave shaping circuits.**

Course Content:

Theory
Unit-I Low frequency analysis of RC coupled amplifiers, effect of coupling and bypass Amplifier at high frequencies, Hybrid-π model equivalent circuit in CE configuration, $f_\alpha, f_\beta, f_\gamma$parameter, High frequency response of single/two stage amplifiers using BJT & FET. Gain-bandwidth product. Effect of cascading on gain & bandwidth, Transformer coupled and Direct coupled amplifier.
Unit-II Feedback Amplifier: General feedback theory, characteristics of negative feedback amplifiers, Effect of negative feedback on input and output resistance of amplifiers. Oscillators: Principle of oscillation, Barkhausen stability criterion, Audio frequency oscillator: Phase shift & Wien bridge oscillators, RF Oscillator: Colpitts & Hartley, Crystal Oscillator.
Unit-III Operational amplifiers: Differential Amplifiers, Constant current source and current mirror circuit, Equivalent circuit of Op-amp, Virtual ground, Offset error in voltages & currents & their temperature drift, Op-amp parameters such as CMRR, PSRR, Slew rate, frequency response of Op-Amp, Study of Op-amp ICs like 741etc., Linear and non-linear application of Op-amp, Integrator, Differentiator, Log& antilog amplifiers, Precision rectifier, comparators, Schmitt trigger , Sample & hold circuit, Instrumentation amplifiers.
Unit-IV Tuned RF voltage amplifiers: Single and double tuned amplifiers, Gain and bandwidth calculations, frequency response of under coupled, critically and over coupled circuits, Over current protection using current limiting fold back and crowbar protection, Regulators using ICs,
Unit-V Multivibrators circuit using BJT and Op-amp, Emitter coupled binary circuit, 555 – Timer IC, application, Square wave and Triangular wave and Sawtooth wave generators, Linear Wave shaping circuits, RC high pass & low pass circuit
Assessment: Evolution of students done through -

Assignments, Seminars ,Quize, Mid sem Test exam, class performance & End exam of Session .

Practical:

List of Experiment:

1. Study of RC Coupled Amplifiers

2. To Calculate the voltage gain, bandwidth & Band-gain-width product of two stage RC coupled amplifier and also observe frequency response of RC coupled amplifier using LT Spice Simulator.

3.(a) To Calculate the voltage gain, bandwidth & Band-gain-width product of single stage Emitter follower and also observe frequency response of RC coupled amplifier using LT Spice Simulator.

(b) To Calculate the voltage gain, bandwidth & Band-gain-width product of single stage Common base amplifier and also observe frequency response of RC coupled amplifier using LT Spice Simulator

4. To obtain the frequency response characteristics of a voltage shunt amplifier, with and without feedback & determine upper and lower cut-off frequencies.5.Verification of Darlington Emitter Follower.

5. To determine the frequency of oscillation of the RC phase shift oscillator AND TO FIND THE PHASE SHIFT OF EACH SECTION OF RC- network.

6. To design A-stable, Mono-stable & Bi-stable Multi-vibrator and observe their output waveform.

7. To design and construct Differential amplifier using BJT in order to calculate common mode gain, Differential mode gain & common mode rejection ratio (CMRR).

8. To design the following using Operational amplifier (IC741) & verify the output response of various opamp applications like summing amplifier, unity follower, integrator, differentiator etc.

9. To design Emitter coupled binary circuit using OP-AMP & BJT, also observe its output waveform

10. To design Single & double Tuned voltage amplifier and study the frequency response

Assessment: Evolution of students done through –

Best one experiment performance, internal viva ,external viva, File preparation and submission

Text Books:

1. Robert Boylsted Electronic devices and Circuits, PHI
2. Sedra & Smith L, Electronic circuits, McGraw Hill.
3. D Choudhury Roy, Linear Integrated Circuits, New Age International

Reference Books:

1. John D. Ryder, Electronics fundamentals & Applications, PHI
2. Milliman and Grabel, Microelectronics, TMH
3. Johns and Martin, Analog Integrated Circuits design, Wiely.
4. Milliman&Halkias Integrated Electronics, McGraw Hill
5. Gayakwad R.A OpAmp 7 Linear Integrated Circuits, PHI

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: EI-27551 SUBJECT NOMENCLATURE: SENSORS& TRANSDUCERS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of physical parameters

Course Outcomes:-

CO1: To discuss role of Sensor and transducers in instrumentation

CO2: Descriptive view for the transducer construction, classification, principle of operation and characteristics.

CO3: Gain knowledge about transducers for measurement of displacement, strain, velocity, acceleration etc.

CO4: To analyze transducers for measurement of pressure and force.

CO5: To discuss about bimetallic and temperature measurement system.

CO6: To discuss about transducers for flow and level measurement.

Course Content:

Theory:

UNIT-1. Role of transducers in instrumentation-Transducers construction, classification and characteristics. Principles of operation and characteristics, interfacing of transducers and signal conditioning

UNIT-2. Transducers for measurement of displacement, strain, velocity, acceleration etc. Potentiometer, LVDT, Strain gauge, capacitance gauge, piezoelectric transducers and accelerometers.

UNIT-3. Force and pressure measurement: **Force**: Standards and Calibration, Basic methods of force measurement (Spring, beam, diaphragm) Strain gauge: basic principal, gauge factor, types of strain gauge, materials and their properties, bonding material compensation techniques, bridge configuration, Rosettes, Tactile sensors, Piezoelectric sensors, LVDT as secondary sensor. **Pressure**: Standards and calibration Units and relations. **Positive Pressure Sensors: Manometers** – U tube, Well type, inclined tube, Ring balance, Micro manometer, use of seal pots, range of measurement **Elastic –** Bourdon, Diaphragm, Bellows and their types, materials and their properties, range of measurement **Electronic –** LVDT, Strain gauge, Capacitive, Piezoelectric, Thin film, Variable reluctance,Vibrating element (Diaphragm and Wire), **High Pressure Measurement –** Bulk modulus cell, Bridgeman type Differential Pressure Measurement: Force balance, Motion balance,

Capacitance delta cell, Ring balance DP cell. **Vacuum measurement:** McLeod gauge, Thermal Conductivity (Pirani, Thermocouple), hot cathode ionization gauge, Molecular momentum(Knudsen) gauge, Cold Cathode ionization (Penning) gauge. Calibrating Instruments – Dead Weight Tester (Pressure,Vacuum).

UNIT-4.Temperature measurement: Temperature Scales, Standards and Units and relations, Classification of temperature sensors. **Mechanical:** Bimetallic Thermometer – Working Principle, Various types, Filled system thermometers – SAMA classifications, Sources of errors and their remedies, Dip effect. **Electrical:** Resistance Temperature Detectors – Principle, materials and their properties, Typesand ranges, different sources of errors and compensations. **Thermistor:** Types (NTC, PTC), Measuring Circuits **Thermocouple:** Terminology, Types (B, E, J, K, R, S,T), determination of polarity, Characteristics, Laws of thermoelectricity, Study of thermocouple tables (calculation of intermediate temperature and voltage), Lead wire compensation, Cold junction compensation techniques, Protection (Thermo well), EMF Measurement methods, Thermopiles **Non-contact Types:** Pyrometers: Total Optical, Infrared.

UNIT-5. Transducers for measurement of flow and level. Turbo magnetic, Electromagnetic and other flow meters. Various methods of level measurements, Ultrasonic level gauge. Measurement of humidity and moisture. Various sensors employed in instrumentation, introduction to MEMS, wireless sensors, finger print sensors. Smart sensors.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Practical:

List of Experiment:

1. To study the characteristics and behaviour of a resistive type transducer (potentiometer).
2. To measure and control temperature using RTD.
3. To calibrate Thermistor and control the temperature.
4. To measure the Strain using Strain Gauge and cantilever assembly.
5. To obtain the linear range of operation of strain gauges.
6. To determine the sensitivity of Strain gauge trainer.
7. To investigate the behaviour and the characteristics of LVDT.
8. To calculate the displacement using parallel plate capacitor.
9. To study Thermocouple working and measure the temperature.
10. To measure the sensitivity of Variable area capacitor.

Assessment: Evaluation of students through Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

Text Books:

1. Nakra B.C. &Choudhory K.K., Instrumentation, Measurement & Analysis, TMH.

Reference Books:

1. Patranabis D., Principles of Industrial Instrumentation. TMH.
2. Murthy, Transducers.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE II Year (4 YDC)
SUBJECT CODE: EI-27562 SUBJECT NOMENCLATURE: DIGITAL ELECTRONICS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of Basic Electronic

Course Outcomes:

CO1: **To understand reduction of logical expressions using Boolean algebra, k-map and tabulation method and implement the functions using logic gates.**
CO2: **To develop combinational circuits for given application and verify its operation**.
CO3: **To gain the knowledge of sequential circuits with their implementations.**
CO4: **To analyze memory classification and structure.**
CO5: **To implement asynchronous and synchronous circuits fall under digital electronics.**
CO6: **To design the basic digital circuits and to verify their operation.**

Course Content:

Theory:

UNIT-1. Minimization Techniques and Logic Gates

Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem -Principle of Duality - Boolean expression - Minimization of Boolean expressions- Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-Mc-Cluskey method of minimization.

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multilevel gate implementations- Multi output gate implementations.

UNIT-2.Combinational Circuits

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – **Serial binary adder** Parallel binary adder, Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/Demultiplexer – decoder - encoder – parity checker – code converters - Magnitude Comparator .

UNIT-3.Sequential Circuits

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation–Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops, Asynchronous counter –Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Design of Synchronous counters: state diagram-State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers– Shift register counters – Ring counter – **Johnson Counter**-Shift counters - Sequence generators.

UNIT -4. Memory Devices

Introduction of memory, Memory architecture, Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write operation – Read operation. Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell. Implementation of combinational logic circuits using ROM, PLA, PAL**.**

UNIT -5. Synchronous and Asynchronous Sequential Circuits

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine. Asynchronous Sequential Circuits**:** Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits. **Designing of hazard free switching circuits.**

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Practical:

List of Experiment:

1. Verification of truth tables of various Logic gates (AND, OR, NOT, NAND, NOR, X-OR & X-NOR).
2. Realization of AND, OR & NOT logic gates using NAND and NOR gate.
3. Analysis of Demorgan's Theorem with Boolean logic equations.
4. Implementation of even & odd parity generator & checker.
5. Study of Half Adder, Full Adder, Parallel Adder,HalfSubtractor and verify their Truth Tables.
6. To study and verify the code conversion circuits. Binary to Gray Code Gray to Binary Code.
7. Studying and verifying the BCD to Excess-3 code conversion circuit.
8. To study and verify 4 to 1 Line Multiplexer and 1 to 4 Line Demultiplexer.
9. Studying and verifying 8 to 3 Line Encoder and 3 to 8 Line Decoder circuit.
10. To study Flip-flops and prove Truth Tables.
11. Verification of the operation of IC 74LS190 as a Modulo –N Programmable Counter
12. To verify the operation of 74LS138 as a 1-of-8 Decoder
13. To verify the operation of 74LS138 as an 8 to 1 Demultiplexer
14. The study of the cascaded connection of two 1-of-8

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

Text Books:

1. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 /

2. Pearson Education (Singapore) Pvt. Ltd., New Delhi.

3. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: MA -27563 SUBJECT NOMENCLATURE: MATHEMATICS-IV

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	1	4	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite:

Course Outcomes:-

CO1: Learn functioning of complex variables.
CO2: Understand statistics & probability & their applications.
CO3: Learn reliability & its applications in electronics system.
CO4: Understand graph theory & optimization.

Course Content:

Theory:

UNIT-1.Functions of Complex Variables: Analytic function, Cauchy-Riemann equations and Harmonic functions: Conjugate functions and their applications. Complex integrals. Cauchy‘s integral theorem and integral formula. Singularities, poles residues, residue theorem, Contour integration for simple cases, conformal mapping and its application to two-dimensional problems in electric field.

UNIT-2. Statistics: Modern view of Probability theory, Random Experiments, Sample space, Random Variables, Distribution Function and Density Function, Random Variables of Discrete and Continuous type, Functions of two random variables, bivariate probability with conditional and marginal probability distribution.

UNIT-3. Stochastic Process and Markov Chain: General concepts and definition of stochastic processes, Mean, Auto-correlation and auto-covariance, Classification of Stochastic Process and some problems. Probability vectors, Stochastic Matrix, Fixed Point of a Matrix, Definition of Markov Chain, Transition matrix and Graph, some theorems and applications, Queuing Theory, Birthand Death Process.

UNIT-4. Reliability: Basic concepts, Failure law, Bath Tub Curve, Evaluation of Reliability of acomponent from test data, System Reliability, Components in series and parallel, Redundancy, Non-series parallel system. A brief idea of software reliability.

UNIT-5. Graph Theory and Combinatorial Optimization: Graphs – Definitions and basic properties. Isomorphism, Euler Circuits and Hamiltonian cycle. Digraphs. Trees- properties, spanning trees, Planer graphs. Shortest path problem, Dijkstra algorithm, Shortest spanning tree- Kruskal and Prim algorithm, Flow augmented paths-Ford-Fulkerson algorithm, cut sets. Max. Flow min. cut Method theorem.

Text Books:

1. G. Paria, Partial Differential Equations and Complex Variables, Scholar‘s Publication, Indore.
2. G. Paria, Statistics and Stochastic Processes Part I and II, Scholar‘s Publication, Indore.
3. Grewal B. S., Higher Engineering Mathematics, 38th Edition, Khanna Publishers, New Delhi, 2005.

Reference Books:

1. Papoulis, Probability, Random Variables and Stochastic Process, McGraw Hill Book Co.
2. E. Balagurusamy, Reliability Engineering.
3. T Veerarajan, Statistics, Probability and Random Process, 2nd Edition, Tata McGraw Hill Publishing Company Ltd

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: EI-27992 SUBJECT NOMENCLATURE: SOFTWARE WORKSHOP

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	4	-	-	2	-	-	-	40	60	100

Pre-Requisite: Knowledge of Basic Fuzzy Logic, Polynomials, Matrix etc

Course Outcomes:-

CO1: To implement the MATLAB Desktop, Command window and the Graph Window
CO2: Be able to do simple and complex calculation using MATLAB
CO3: Be able to carry out numerical computations and analyses
CO4: To apply the mathematical concepts upon which numerical methods.
CO5: Todiscuss the tools that are essential in solving engineering problems

Course content:

Practical on:

Introduction to MATLAB: MATLAB Interactive Sessions

Functions & Files

Plotting: XY- plotting functions, Bar Graphs, Area Function, STEM Function, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

Linear Algebraic Equations

Symbolic Processing With MATLAB:

Practical:

List of Experiment:

1. Elementary Operations
2. The command window
3. Vector and Matrices
4. Element by ElementOperations
5. Graphics
6. Scripts
7. Functions
8. Flow Control
9. Symbolic Computation

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

Text Books:

1. Introduction to MATLAB for Engineers 3^{RD} edition by William Palm III.
2. A Guide to MATLAB: For Beginners and Experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

SUBJECT CODE: HU-27881 SUBJECT NOMENCLATURE: VALUES, HUMANITIES & PROFESSIONAL ETHICS

HOURS PER WEEK			CREDITS		MAXIMUM MARKS				
L	T	P	Th	Pr	THEORY		PRACTICAL		TOTAL MARKS
					CW	END SEM	SW	END SEM	
-	2	-	2	-	100	-	-	-	100

PRE-EQUISITES:

NIL COURSE

OBJECTIVES:-

1. To make students understand of his/her social responsibility as an engineer.
2. To create an awareness on Engineering Ethics and Human Values
3. To make students capable of doing self-exploration and recapitulation
4. To make students aware of the global problems

COURSE OUTCOMES: After completion of course, the students will be able to:

1. Explain and elaborate the social institutions through which the society and nation isgoverned.
2. Describe the kinds of values and ethics and their importance
3. Contextualize the professional attitude and approaches as per needs of society and values.
4. Explain and illustrate the process of Social, Political and Technological changes in-context to global changes

COURSE CONTENT:

UNIT 1. Role of Humanities in Engineering education,social institutions and association, social stratification in India, social change and its determinants.

UNIT 2. Self Exploration, recapitulation, coexistence of self and body and their needs and activities, Morals, Values and Ethics, Universal and Situational values, . Balance between - rights and duties,

UNIT 3. Concept of personal and group Ethics: Ethical and decision making capability and its development: Meaning of Ethical dilemma, steps to solve ethical dilemma.

UNIT 4. Engineering Ethics: engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger variety of moral issued - types of inquiry - moral dilemmas – moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy Models of Professional Roles.

UNIT 5. Global Issues: Multinational corporations - Environmental ethics - computer ethics - weapons development – engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership.

ASSESSMENT:

Only **Sessional Work** (100 marks) on the basis of internal viva (30) Attendance (20),Quizes/Tests (30) and Presentations (20) will be awarded against the assessment donethroughout the session.

Books for references

1. Little, William: An Introduction of Ethics (allied Publisher, Indian Reprint1955)
2. William, K Frankena : Ethics (Prentice Hall of India,1988)
3. Gaur R. R., Sangal R. and Bagaria G. P., Haman Values and Professional Ethics,Excel Books, New Delhi, 2010
4. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York1996.
5. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall ofIndia, New Delhi, 2004

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE II Year (4 YDC)

HUM 2251/3xxxx: Constitution of India

HOURS PER WEEK			CREDITS		MAXIMUM MARKS				
L	T	P	Th	Pr	THEORY		PRACTICAL		TOTAL MARKS
					CW	END SEM	SW	END SEM	
-	1	2	-	-	100	-	-	-	100

PRE-REQUISITES: NIL

COURSE

OBJECTIVES:-

1. To make students understand the importance of Indian constitution.
2. To create an awareness about fundamental rights and fundamental duties.
3. To make students aware of the working of the union government.
4. To make students comprehend the importance of judicial powers and emergency provisions inIndia.

COURSE OUTCOMES: After completion of course, the students will be able to: 1.Explain and elaborate the Indian Constitution through which the society and nation isgoverned.
2. Describe the list of fundamental rights and fundamental duties.
3. Elucidate the types of emergencies in Indian constitution.
4. Explain and illustrate the procedure of amendments in Indian constitution.

Course Contents

UNIT 1. Meaning and significance of Constitution, Making of Indian Constitution –Sources, Salient features of Indian Constitution and Preamble.

UNIT 2. Scheme of the Fundamental Rights and Duties : right to Equality-article 19- article 21, legal status of duties, Directive Principles of states policy- its importance andimplementation,

UNIT 3.Federal structure, legislative and financial powers (union and states), Three lists (union, state and concurrent), parliamentary form of government in India- The constitutionpowers and status of the President of India.

UNIT 4. :Judicial system and local governance in India: Its constitutional powers, Historical perspectives of the constitutional amendments in India, Amendment of theconstitutional powers procedure, Local self government - 73rd and 74th Amendment.

UNIT 5. Emergency provisions: President rule, National Emergency, FinancialEmergency, Election commission and its constitutional powers and procedures.

ASSESSMENT:

Only **Sessional Work** (100 marks) on the basis of viva (30) Attendance (20), Quizes/Tests/Activities (30) and Presentations (20) will be awarded against the assessmentdone throughout the session.

Books Recommended:

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D. Basu
4. 'Indian Administration' by Avasti and Avasti

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: IT-37005 SUBJECT NOMENCLATURE: DATA STRUCTURE

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of Basic computer

Course Outcomes:

CO1: Understand data structure stack queues, lists, trees, complexity etc. in detail.
CO2: Study memory hierarchy, management techniques partitioning, segmentation, paging and comparison of techniques.
CO3: Gain knowledge about CPU scheduling and multiprogramming
CO4: Understand file systems and Input / Output operations.
CO5: Case studies on MS-DOS, UNIX and WINDOWS NT.

Course Content:

Theory:

UNIT-1. Data structures: Stacks Queues, Lists, Trees, Definition of complexity, Sorting, Theory of sorting, Searching, Matrix manipulations, sets of strings, OS: Evolution, different types, features of OS.

UNIT-2. Memory: Hierarchy, management techniques partitioning, swapping, paging, segmentation, paged segmented memory, comparison of techniques, virtual memory, demand paging & replacement policies.

UNIT-3. CPU Scheduling: Scheduling Criteria, Types of scheduler, process & processor scheduling, Types of CPU Scheduling, Multiple Processor Scheduling, Multicore Processor, Multi-Programming.

UNIT-4. Files systems: User & systems view of file system, disk organization, disk allocation method contiguous, linked, indexed methods. File protection, system calls, disk scheduling.

UNIT-5. Input/Output: Asynchronous operation, speed gap, programmed I/O, Interrupt driven I/O, Deadlock prevention, avoidance, recovery. Case study: MS-DOS, UNIX & WINDOWS NT. Introduction to system administration.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books:

1. Peterson &Silsberschatz : Operating system & concepts
2. Godbole: OS & core studies of UNIX & WINDOWS NT.
3. A.Tannenbaum : Data structure using C/C++

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: EI-37006 SUBJECT NOMENCLATURE: MICROPROCESSOR SYSTEMS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: - Digital electronics, Introduction to Microprocessors
Course Objective: - Students should be able to: Understand design parameters of microprocessor and microcontroller based circuits. Understand architecture of 16/32 bit microprocessor. Design and analyze various peripherals required for microprocessor circuits.
Course Outcomes:-
CO1: To describe the evolution and organization of microprocessors and microcomputers along with its basic architecture and register set.
CO2: Able to illustrate 8085 microprocessor.
CO3: Developing skills of designing assembly language programming of microprocessors.
CO4: Develop knowledge & skills for interfacing I/O devices and peripheral sub-systems.
CO5: To develop an in-depth understanding of the operation of microprocessors – 8086
CO6: To discuss various other advance microprocessors.

Course content:

Theory:

UNIT-I – Introduction to Microprocessor & 8085 Microprocessor
Evolution of Microprocessors, organization of Microcomputers, Types of microprocessors, 8085 Microprocessor Architecture, arithmetic logic unit and control unit, Instruction cycle and timing diagram , instruction Set of 8085, Addressing Modes.
UNIT-II - Programming with Microprocessor
Assembly Language Programming Basics, Instruction and data Formats, Looping, counting and indexing using data transfer, arithmetic, logical and branch instructions. Stack & Subroutines, Time Delay routines, Programming of microprocessor, Interfacing Memory and I/O devices: Memory mapped I/O and I/O mapped I/O, latches and tri-state buffers.

UNIT-III - Interfacing Device and peripheral subsystems:

I/O INTERFACE: Programmable peripherals interface 8155 and 8255, their features, programming and applications. Programmable interrupt controller 8259, USART 8251, keyboard controller 8279, and direct memory access data transfer (DMA), ADC and DAC chips and their interfacing.

UNIT-IV Introduction to 16 bit Microprocessor
Architecture of 8086, Register Organization, pin description, Programming Model, Memory addresses, Addressing Modes, Memory Segmentation, Physical Memory Organization, Signal descriptions of 8086-Common Function Signals, Minimum and Maximum mode signals, Timing diagrams.

UNIT-V

ARM PROCESSOR: Fundamentals, Registers, Current program status register, Pipeline, Interrupt and the vector table. **Advanced Microprocessors**: RISC and CISC Architecture, Introduction to SUN SPARC Microprocessor.

Assessment: Evolution of students done through - Assignments, Seminars ,Quiz, Mid sem Test exam, class performance & End exam of Session .

Practical:

CO7: Analyze, design, and simulate various programming based on microprocessor and its peripheral.
CO8: Able to work on software like Keil & Proteus (as programming & Simulation platforms)

List of Experiment:

1. Write an Assembly language program to copy 8-bit data.
2. Write an Assembly language program for addition of two 8-bit numbers.
3. Write an Assembly language program for addition of two 16-bit numbers with carry.
4. Write an Assembly language program for subtraction of two 8-bit numbers.
5. Write an Assembly language program to copy a series of data.
6. Write an Assembly language program to find the largest number of given series.
7. Write an Assembly language program to find the smallest number of given series.
8. Write an Assembly language program to arrange a given series in ascending order.
9. Write an Assembly language program to arrange a given series in descending order.
10. Write an Assembly language program to multiply to 8-bit numbers.

Assessment: Evolution of students done through – Best one experiment performance, internal viva , external viva, File preparation and submission

Text Books :

1. Gaonkar R.S., Microprocessor architecture programming and application with the 8085/8088
2. Douglous Hall, Microprocessor and interfacing.
3. Bray &Treibel: Intel Microprocessors 8086, Pearson Education

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: EE -37003 SUBJECT NOMENCLATURE: CONTROL SYSTEM-SEMESTER 'A'

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				
							TH	CW	SW	Pr	Total
EE 37XXX	Control System	4	-	2	3	1	70	30	40	60	200

Course Objectives:

Control Engineering plays a fundamental role in modern technological systems. The aim of this course is to serve as an introduction to control system analysis and design .A control system consisting of interconnected components is designed to achieve a desired purpose. Modern control engineering practice includes the use of control design strategies for improving manufacturing processes, the efficiency of energy use, advanced automobile control.

The objectives include equipping students with:

1. Basic understanding of issues related to control systems such as modelling, time and frequency responses of dynamical systems, performance specifications.
2. Techniques for determining stability of systems.
3. Basic design aspects of various controllers and compensators.
4. Dynamical system analysis using state space model.

UNIT: 1

Modelling of Dynamic Systems and Simulation - Integro-differential equations of linear systems such as mechanical, hydraulic pneumatic and electrical systems. Block diagram and Signal flow graph method of representing the dynamic equations, Analogue simulation, linearity, impulse response and concept of transfer function, Mason's gain formula, control systems components - Errordetectors, a-c and d-c Servomotors, servo-amplifiers (a-c & d-c) using operational amplifiers, Gyro, Resolver. Typical study of characteristics of these components. Concept of feedback as control theory - mathematical theory of feedback, return ratio, return difference, open and closed loop, understanding the necessity of feedback as real control action supplemented by a small example.

UNIT: 2

Time-Domain Analysis of Feedback Control Systems - Typical reference test signals and their significance, transient behaviour of closed loop systems under feedback control. Proportional plus derivative and rate feedback control actions for improving the transient response. Steady state behaviour of closed loop feedback control systems. Types of open loop transfer functions. Steady state errors. Proportional plus integral control action for the improvement of steady state errors.

UNIT: 3

Frequency-Domain Analysis of Feedback Control Systems - Concept of frequency-domain analysis, Bode plots, Polar plots. Bode of closed loop transfer function Mp and Bode plots of error transfer functions, Principle of Argument, Nyquist criteria. Conditionally stable closed loop systems, Transportation lag, Constant M and constant N loci, Loci of closed loop poles (root loci).

UNIT: 4

Compensation Techniques - Need for frequency-domain compensation, Different types of compensation, Phase-lead and Phase-lag compensation, Design of compensating networks for the desired frequency-domain closed loop performance.

UNIT: 5

State Space Method of Analysis - Fundamentals of state space: concept of state and state variable. Representation of linear system through state dynamics, Calculation of Eigen-values and Eigen-vectors, Modal matrix, Modal transformation, Elementary understanding controllability and observability, state feedback control. Stability analysis of feedback control systems - concept of stability, BIBO stability, asymptotic stability, Routh-Hurwitz stability analysis. Nyquist stability analysis and relative stability, gain margin and phase margin.

Course Outcomes

After completing the subject student will be able to:

EE37003(T).1: Understand the dynamic systems and analyze mathematical modelling of physical systems such as Electrical, Mechanical, Thermal and Hydraulic.

EE37003(T).2: Evaluate the time domain and frequency domain design specifications of the system and error dynamics of first and second order systems with various inputs.

EE37003(T).3: Application of frequency domain analysis for ascertaining stability in time and frequency domain using Routh Hurwitz analysis, Root Locus, Nyquist and Bode Plots.

EE37003(T).4: Designing of Lead, Lag and Lead-Lag compensators for desired frequency domain closed loop performance, Designing of PID Controllers.

EE37003(T).5: Understanding the concept of controllability and Observability by state space analysis, State feedback Controller design with Pole Placement.

Course Assessment: Students will be assessed on

(a) Continuous evaluation through two mid-term test with a weightage of 30% of the total marks. It includes class attendance as well as assignments on the course topics.
(b) The end-term theory examination weightage is 70%.

Text Books:

1. B. C. Kuo, ‒Automatic Control Systems‖, ninth edition, Wiley India, 2009.
2. K. Ogata, ‒Modern Control Engineering‖, fifth edition, Prentice-Hall, 2010.

Reference Books:

1. J. L. Melsa& D. G. Schultz, ‒Linear Control Systems‖, McGraw Hill, New York, 1969.
2. I. J. Nagrath& M. Gopal, ‒Control Systems Engineering‖, fifth edition, New Age International (P) Ltd, New Delhi, 2009.
3. Joseph J. DiStefano, Allen R. Stubberud, Ivan J. Williams. ‒Schaum's outline of theory and problems of feedback and control systems‖, McGraw-Hill, 2011.

List of Experiments

1. To determine the performance characteristics of an angular position error detector using potentiometers.
2. To determine the characteristics of a Synchro Transmitter Receiver pair and use as a torque synchro and angular error detector.
3. To find the transfer function of an A.C. Servomotor.
4. To find the transfer function of a D.C. Servomotor.
5. To control the angular position of an AC servo motor as a carrier control system.
6. Determination of the time response characteristics of a DC Servo angular position control system.
7. To perform closed loop Speed control of a D.C Servomotor.
8. To determine the performance characteristics of a DC motor speed control with PWM type power driver.
9. To determine the performance characteristics of a DC motor speed control with SCR type power driver.
10. Analysis of Proportional + Integrator + Derivative (PID) control actions for First and second order systems.

Laboratory Outcomes:

EE37003(P).1: The student should be able to turn into practice the theoretical concepts of linear control system.

EE37003(P).2: Analyze system performance under the effect of different controllers.

EE37003(P).3: Determine the stability of a well-defined transfer function using simulation tools.

EE37003(P).4: Visualize the performance parameters of LTI system in real life.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)

SUBJECT CODE: EC-37014 SUBJECT NOMENCLATURE: ANALOG AND DIGITAL COMMUNICATION

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite:

Course Outcomes:-

CO1: Understand mathematical representation of signals.
CO2: Various transmission schemes used in analog& digital communication.
CO3: Designing a communication system sub parts.
CO4: Performance comparison of various analog& digital communications.

Corse Content:

Theory:

UNIT-1. Signals and Random Variables: Types of signals: deterministic & random, periodic & non-periodic, analog & discrete, energy & power signals. Fourier series, Fourier transform and its properties, Gaussian and Rayleigh probability density function, mean, variance and standard deviation, central limit theorem, Voltage & Power decibel Scales.

UNIT-2. Amplitude Modulation: Need of modulation in a communication system, block schematic of a typical communication system. AM modulation system, modulation index, generation & detection of AM wave, side bands & power content in an AM wave, DSB-SC, SSB, their methods of generation & detection, AM transmitter block diagram.

UNIT-3. Frequency Modulation: Relationships between phase & frequency modulation, FM wave & its spectrum, Phasor diagram of narrowband FM signal, wideband FM, methods of generation & detection of FM, discriminators, pre-emphasis & de-emphasis.

UNIT-4. Receivers and Noise: TRF receiver & its limitations, necessity of heterodyning, Super heterodyne radio receivers, IF amplifiers & selection of intermediate frequency, RF amplifiers, detectors. Sources of noise, noise figure, noise bandwidth, effective noise temperature.

UNIT-5. Introduction to Digital Communication: Nyquist sampling theorem, time division multiplexing, Pulse modulations and PCM, quantization error, introduction to BPSK & BFSK, Shannon‘s theorem for channel capacity.

Text Books:

1. Lathi B.P.,Anolog and Digital Communication Systems, Oxford Press.
2. Singh R.P. &Sapre, Communication Systems Analog& Digital, TMH.
3. Kennedy George, Electronic Communication System, McGraw Hill.

References Books:

1. Haykin Simon, Communication Systems, John Willey & Sons.
2. Taub& Schilling, Principles of Communication Systems, McGraw Hill.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: IP-37251 SUBJECT NOMENCLATURE: ELECTIVE 1(INDUSTRIAL ENGINEERING & MANAGEMENT)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite:

Course Outcomes:-

CO1: Learn work place design, work measurement tests & technology.
CO2: Understand concept of operations & organization management.
CO3: Learn operational research, linear programming, transportation models and its applications.
CO4: Apply and learn quality control & its economics.

UNIT-1. Methods Engineering:
(a) Introduction to methods engg. and productivity, method study, recording techniques, work measurement tools and techniques.
(b) Work place design, fundamentals of work place design.
(c) Introduction to job evaluation and wage incentive schemes.

UNIT-2. Operations Management:
(a) Introduction to production planning and control, functions, tools and techniques, types of production system.
(b) Facilities planning, introduction to plant layout and material handling tools & techniques.

UNIT-3. Organization and Management:
(a) Principles of management and management functions:
(b)Organization principles, structures, span of control, delegation, centralization and decentralization, formal and informal organizations.
(c) Personal management - Introduction, communication, motivation and leadership.

UNIT-4. Quantitative techniques for decision making: Introduction to operations research, linear programming, transportation and assignment, models and its applications, network techniques and its application.

UNIT-5. Quality control:Quality planning and quality control operation, economics of quality control, process capability studies and control charts for variables and attributes, Sampling.

Text Books:

1. Barnes R. M., Time and Motion study.

2. ILO Work Study.
3. Mahajan M., Industrial Engg. And Production Management

References Books:

1. Koontz and O'Donnel, Principles of Management,
2. Eilen S., Production Planning and Control
3. Sharma S. D., Operation Research.
4. Grant E. L., Statistical Quality Control.
5. Wagner, Principles of operation research, PHI

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: EI-37252 SUBJECT NOMENCLATURE: ELECTIVE 1(INSTRUMENT SYSTEM DESIGN)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite: Knowledge of Microcontroller

Course Outcomes:

CO1: To work on PCB designing software‘s.
CO2: To design Microcontroller based electronic circuit
CO3: To interpret data sheets & specifications of various logic families & IC‘s

Course Content:

Project design based on following topics:

1. Microcontroller based robot
2. Microcontroller based digital design
3. Microcontroller based analog design
4. Aurdino- controller based designs
5. RF IC based design

Practical:

List of Experiment:

1. Introduction and Precautions for the laboratory providing SAFETY to users.
2. Study and Hands-on Tools required in the Laboratory.
3. Briefing about Electronic components for their ON/OFF condition and testing their working status and values.
4. Introduction about soldering process and soldering practice on a general purpose PCB with Soldering Iron, Soldering wire, flux and connecting wires.
5. Design and Implementation of Minor Project in working condition on Bread Board.
6. Construction of Minor Project on Printed circuit Board

- Precautions
- PCB Designing
- Layout Designing
- Etching Process
- Drilling Process

- Component Assembly
- Soldering
- Testing of the Project

7. Preparation of Minor Project

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

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ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: EI 37481 SUBJECT NOMENCLATURE: TEST & CALIBRATION LABORATORY

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	4		-	2	-	-	-	40	60	100

Pre-Requisite: Knowledge of Basic Instrumentation

Course Outcomes:

- **CO1** **Learn the static and dynamic characteristic of measurement system**
- **CO2** **Understand the concept of testing of measuring equipment.**
- **CO3** **Analyzing the errors of the electronic equipment.**
- **CO4** **Apply and learn the calibration of test equipment.**

Course Content:

Testing & Calibration of measurement setup: Dynamic Characteristics: Dynamic response; Transient response; speed of response, fidelity, measuring lag etc.
Linear approximation, compensation techniques. Significance of testing and calibration, Calibration curve, Standards for calibration, Different calibration procedures-primary, secondary, direct, indirect, routine calibration, Calibration setup:-pressure gauge, level etc. Calibration of Ammeter, Voltmeter and Wattmeter, Energy meter.
Analysis of Errors: Definition; Types of errors; Calculation methods of different errors; Gaussian curve; Precision Index; Variance; Standard deviation; Uncertainty in measurement, Chi-Square Test, Curve fitting methods. Galvanometers: D'Arsonaval Galvanometer— construction, Torque equation, Dynamic characteristic, Balastic Galvanometer.

Practical:

List of Experiment:

1. Study of static and dynamic characteristic of measurement system
2. Testing of active and passive component with CRO and multi-meter.
3. To derive and analyze mathematical modeling for measurement system.
4. Testing of voltmeter for calibration error.
5. Testing of ammeter for calibration error.
6. To study type of error curve.

7. Calibration of ammeter using DC potentiometer.
8. Calibration of voltmeter using DC potentiometer.
9. Calibration of the scale of voltmeter.
10. To study type of Gaussian curve

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: EI-OC-III SUBJECT NOMENCLATURE: ANALYTICAL INSTRUMENTATION

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	1	3	-	3	-	50	-	50	-	100

Pre-Requisite: Knowledge of human physiology and anatomy

Course Outcomes:

1. To provide various techniques and methods of analysis which occur in the various regions of the spectrum.
2. To give unique methods of separation of closely similar materials, the most powerful being gas chromatography
3. To discuss important methods of analysis of industrial gases. Awareness and control of pollution in the environment is of vital importance.

Corse Content:

Theory:

UNIT I COLORIMETRY AND SPECTROPHOTOMETRY

Special methods of analysis : Beer-Lambert law, Colorimeters , UV-Visible 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 –Fluorescence spectrophotometer

UNIT II CHROMATOGRAPHY

Different techniques: Gas chromatography, Detectors,Liquid chromatographs, Applications, High pressure liquid chromatographs, Applications.

UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS

Types of gas analyzers: Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbon s, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV pH METERS AND DISSOLVED COMPONENT ANALYZERS

Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, cyclic volta-metry, biosensors, dissolved oxygen analyzer – Sodium analyzer – Silicon analyzer.

UNIT V ELECTRO MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES

NMR – Basic principles – NMR spectrometer,

Applications. Electron spin Resonance spectroscopy– Basic principles, Instrumentation and applications. Scanning Electron Microscope (SEM), - Basic principles, Instrumentation and applications. Transmission Electron Microscope (TEM) –

Basic principles – Instrumentation and applications. Mass spectrometers – Different types – Applications.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 50% of total marks. Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 50% of total marks.

Text Books:

1. G.W. Ewing, _Instrumental Methods of Analysis‘, McGraw Hill, 1992.
2. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999
3. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, _Instrumental Methods of Analysis‘, CBS publishing & distribution, 1995.

References Books:

1. Robert D. Braun, _Introduction to Instrumental Analysis‘, McGraw Hill, Singapore, 1987.
2. R.S. Khandpur, _Handbook of Analytical instrumentation.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: EI-37511 SUBJECT NOMENCLATURE: FILTER DESIGN AND SIMULATION

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of Op-amp, DSP

Course Outcomes:-

CO1: To discuss various active network elements, control sources and properties of GIC, Nic, gyrators using Op-amp.
CO2: Evaluation of elliptical filters and fundamentals of approximation theory.
CO3: To implement realization of Butterworth filters of first order and second order using Op-amp
CO4: Analyzing active networks using IAM approach and its implementation.
CO5: To discuss LC ladder simulation, cascade realization, Kerwins circuit and other filter circuits and its simulation.

Course Content:

Theory:

UNIT-1. Active Network elements, various control sources, ideal and non-ideal conditions, properties of GIC, NIC, gyrators, FDNR etc. using Op-Amp. Impedance, inversion factor, inductance simulation using linear active circuits.

UNIT-2. Fundamentals of approximation theory, Butterworth‘s and Chebyshev approximation and elliptic filters, Introduction to elliptical filters.

UNIT-3. Realization of Butterworth‘s filters of first order& second order using Op-Amps. Low pass, High pass, All pass, Band pass and Band reject type of filters. Active resonant band pass filters,Gain boost circuit.

UNIT-4. Analysis of Active networks using IAM approach, reduction of multipole and its implementation parallel connections of multipoles, analysis of networks containing active elements and operational amplifiers.

UNIT-5. LC ladder simulation, cascade realization, Sallen‘s and Key‘s filters and their realization, Kerwin‘s circuit, constant KLC filters and their analysis, M-derived filters, composite filters attenuators, switched capacitor filter, introduction to digital filters, Simulation of filter circuit.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Practical:

List of Experiment:

1. To study Butterworth active Low Pass Filter and plot its frequency response.
2. To study Butterworth active High Pass Filter and plot its frequency response.
3. Tostudy and verify Butterworth active Band Pass Filter and plot its frequency response.
4. To study Butterworth All Pass Filter and plot its frequency and phase response.
5. To study Butterworth second order High Pass Filter and plot its frequency response.
6. To study Butterworth second order Low Pass Filter and plot its frequency response.
7. To study Butterworth Notch Filter and plot its frequency response.
8. To study Butterworth Band Reject Filter and plot its frequency response.
9. To study Chebyshev active second order Low Pass Filter and plot its frequency response.
10. Compare various filter topologies for Band Pass Filter operation.

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

Text Books:

1. Temes G.C. and Lapatra J.W., Circuit Synthesis and Design.
2. Mitra S.K., Analysis and Synthesis of linear Active Networks.
3. Van Valkenburg and R.Schuman: Active Filter Design

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: EI-37513 SUBJECT NOMENCLATURE: HIGH FREQUENCY ENGINEERING

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	3	-	-	30	70	-	-	100

Pre-Requisite: Knowledge of Electronics devices and circuits, Basic electronics

Course Outcomes:

CO 1: To describe Maxwell's equation & wave equation & their interpretation.
CO 2: To discuss concepts of waves.
CO 3: Gain knowledge of transmission lines & waveguides.
CO 4: To discuss working and operation of high frequency components like magnetron, klystron, TWT.
CO 5: To discuss the voltage and current of transmission lines,

Course Content:

Theory:

UNIT-1 Review of Wave Propagation: Maxwell‘s equations and its importance at high frequency, Wave, Propagation through various media, behavior of passive components at high frequency, equivalent circuit of R, L, C, Skin effect, Skin depth.

UNIT-2 Introduction to Transmission lines-I: Two wire transmission line, its equivalent circuit, equation for voltage and current of transmission line, characteristics impedance, reflection coefficient, input impedance of transmission line, lossy and loss-less transmission lines, primary and secondary constants of transmission line Standing waves and VSWR.

UNIT-3 Transmission lines-II: Open and Short circuited transmission lines, their voltage and current equations, input impedance of short and open circuited transmission line, Concept of impedance matching, perfectly matched transmission line, Stub matching, Single and double stub technique, causes of attenuation in transmission. Smith chart and its applications, calculations using Smith chart, importance of Smith chart at high frequency.

UNIT-4 Wave Guides: Waves between parallel planes of perfect conductors, types: Parallel plate, rectangular, circular wave guides, Field equations, modes in wave guides, excitation of modes, field patterns, cut-off wavelength and phase velocity, dominant mode, transverse Electric and Transverse Magnetic (TE and TM) waves, Wave impedances, attenuation in wave guides.

UNIT-5 High frequency devices: High frequency Transistors and their equivalent circuit analysis,

microwave diodes like IMPATT, BARITT, TRAPATT, Gunn diode, microwave semiconductor devices. Klystron, Magnetron and TWT. IOT (Inductive Output Tube) IOT (Inductive Output Tube) Construction &operating principle. Comparison of IOT with Klystron.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizingSeminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books:

1. Jordan E.C.,EM Fields and wave propagation systems, Pearson Education
2. IMPACT Teaching Modules on High Frequency Engineering
3. N. N. Rao, Elements of Electromagnetism, Pearson Education

References Books:

1. K. D. Prasad, Antenna and Wave Propagation, Satya Prakashan, New Delhi

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: EC-37512 SUBJECT NOMENCLATURE: DIGITAL SIGNAL PROCESSING

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite:

Course Outcomes:-

CO1: Learn characteristics of signals & systems like time invariant, linear nonlinear, causal etc
.CO2: Gain knowledge of Z-transform & analyzing discrete system using Z-transform.
CO3: Designing digital filters & their implementation.

Theory:

UNIT-1. Discrete time signals & systems : Introduction, types of signals, discrete time signal sequences, discrete time systems, linear shift invariant systems, Stability & causality, linear constant coefficient difference equation, frequency domain representation of discrete time systems & signals, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time signals.

UNIT-2. Z-Transform and Transform analysis of LTI systems: Z-transform, Inverse Z- transform, properties of Z-transform, one sided Z-transform and its applications, system function, frequency response of LTI systems, minimum phase and linear phase systems.

UNIT-3. Discrete Fourier transform(DFT), and its computation: Discrete Fourier Series, Discrete Fourier Transform, Linear convolution using Discrete Fourier Transform, Computation of DFT, Goertzel's Algorithm, Decimation in time FFT algorithms, Decimation in frequency algorithms, FFT algorithms for N (a composite number), chirp Z-transform algorithm.

UNIT-4. Implementation of digital filters: Signal flow graph representation, Realization of IIR & FIR systems, direct form, Transposed form, Parallel form, Cascade form, Lattice structure for IIR and FIR filters, Parameter quantization effect.

UNIT-5. Digital filter design techniques: Design of IIR digital filters using Impulse-invariant and bilinear transformation methods, Design of FIR filter using Windowing methods, Design examples.

Text Books:

1. Oppenheim & Schafer, Discrete Time Signal Processing, Pearson Education.
2. Proakis, Digital Signal Processing, Pearson Education.
3. MitraSanjit, Digital Signal Processing A Computer Based Approach, TMH

Reference Books:

4. Schaum‘s Outline Series, Digital Signal Processing.
5. Ludeman L.C., Fundamantels of DSP, John Wiley.
6. Farooq Husain, DSP and its Application, UmeshPubl, New Delhi.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: EI-37701 SUBJECT NOMENCLATURE: MICROCONTROLLER & EMBEDDED SYSTEM (ELECTIVE -II)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Basic Microprocessor, I/O Devices, Memories etc

Course Objective: To analyze the basic concepts and architecture associated with different microcontrollers families. Descriptive view about 8051 family of microcontrollers and designing assembly language programs for Different scenarios and calculations. Illustration of different devices interfacing with 8051 microcontroller

Course Objectives:

CO 1: Analyze the basic concepts and architecture associated with different microcontrollers families.
CO 2: Descriptive view about 8051 family of microcontrollers and designing assembly language programs for Different scenarios and calculations.
CO 3: **Illustration applications and design of microcontroller (8051) based system.**
CO 4: Evaluation of embedded system, its characteristics and applications by using few case studies.
CO5: To discuss various software architecture of embedded systems & RTOs.

Course Content:

Theory:

Unit-1. Introduction to microcontrollers, Features of various families of microcontrollers. **Similarities & Difference between general purpose & application specific, Van Neumann and Harvard Architecture. Applications of Microcontrollers in real-world.**

Unit-2. 8051/ ARM Controllers Family of Microcontroller. Features and Architecture, Programming model ,GPRs & SFRs, timer, interrupts, instruction set & timing diagram, Assembly language programming, **8051- Timer/Counter and Programming, External Memory Interfacing.**

Unit-3. Applications and design of microcontroller (8051) based systems:
Interfacing of LEDs, 7 Segment display device, LCD display, DIP Switches, Push Button switches, Key denounce techniques, Keyboard connections load per key and matrix form, Interfacing A/D converter, D/A converter, Relay, stepper motor and DC motor.

Unit-4.

Introduction to Embedded systems, **Functional unit of Embedded system, Categories of embedded systems,** Characteristics and their applications.
Hardware architecture of Embedded system- Design Process step & Design cycle, System planning and development of project **(life cycle models- waterfall, V-model, spiral & rapid prototype)**. Few case studies

Unit-5. Various Software architecture of embedded systems, Real time operating system- **block diagram, Types, characteristics & scheduling.**

Assessment: Evaluation of students done through -
Assignments, Seminars ,Quiz, Mid sem Test exam, class performance & End exam of Session .

Practical:

List of Experiment:

1.Data Transfer Programming
2.Arithmetic Instruction Programming
3.Boolean& Logical Instruction Programming
4.Counter Programming.
5.Code conversion Programming
6.Serial Communication Programming.

Assessment: Evaluation of students done through –
Best one experiment performance, internal viva ,external viva, File preparation and submission

Text Books :

1.Muhammad Ali Mazidi, Janice GillispieMazidi, The 8051 Microcontroller and embedded systems
2.Microprocessor and Interfacing, Programming and hardware by Douglas V. Hall, McGraw Hill.
3.Jonathan.W.Valvano, Embedded Microcomputer Systems" Brooks-Cole Publilshers.

References Books;

1.An Embedded software premier By David E. Simon Addison-Wesley.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: ME-37502 SUBJECT NOMENCLATURE: (MECHANICAL MEASUREMENTS)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite:

Course Outcomes:

CO1: Learn the types of measurement, errors & their analysis.
CO2: Understand principle of mechanical measurement, electrical, optical etc.
CO3: Measurement of quantities like force, torque, vibration, shock, sound etc.
CO4: Mechanical elements like dampers, flappers, nozzles, valves etc.

Theory:

UNIT-1. Theory of Measurements: Static and dynamic characteristic of instruments. Standards and calibration. Systematic and random errors. Error analysis. Reduction of errors. Null balance, ratiometric and averaging techniques.

UNIT-2. Metrology: Design principles of measurement instruments, Principles of Mechanical measuring instruments, Electrical measuring instruments, Optical measuring instruments and pneumatic instruments Linear and angular measurements. Measurement of flatness, Straightness, and roundness, Sine bars and slip gauges, Angle gauges and autocollimators.

UNIT-3. Mechanical Measurement: Measurement of displacement, Velocity, Acceleration, Force, Torque, Strain, Shock, Vibration and Sound. Hydraulic and Pneumatic control valves and actuators. Measurement and control of Pressure, Flow Level, Temperature and Humidity.

UNIT-4. Mechanical Elements: Energy storing elements, suspension systems and dampers, pivots, bearings, gears locks and stops, coupling and clutches, levers and linkages.

Text Books :

1. Hume K. J., Engg. Metrology, Kalyan Pub., 1970.
2. Nakra B. C., Choudhary K. K., Instrumentation, Measurements and Analysis, Tata McGraw Hill, New Delhi.
3. Raman R., Elements of Precision Engg., Oxford IBH, 1984.

References Books:

1. Buck and Beckwith, Mechanical Measurments

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: EI-37XXX SUBJECT NOMENCLATURE: SMART AND WIRELESS INSTRUMENTATION (ELECTIVE -II)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Course Objectives:

1. To introduce the technologies and applications for the emerging domain of Smart and wireless Instrumentation.
2. To train students to design and development of the various layers in the WSN protocol.
3. To elaborate the various issues related to smart and wireless Instrumentation implementation.
4. To familiarize the students with the hardware and software platforms used in the design of WSN.
5. To elaborate the applications of various smart and wireless systems.

Course Outcomes:

Students will be able to

1. Analyze Smart and Wireless Instrumentation with respect to various performance parameters.
2. Design and develop Applications using WSN (Wireless sensor Network).
3. Demonstration of various Node architectures.
4. Demonstration of Fundamentals of wireless digital communication
5. Analyze the power sources

Unit I: Introduction

Smart Instrumentation(Materials, automation systems, ensing and Sensors, Sensor Classifications, Wireless Sensor Networks, History of Wireless Sensor networks (WSN), Communication in a WSN, important design constraints of a WSN likeEnergy, SelfManagement, Wireless Networking, Decentralized Management, Design Constraints, Security etc.

Unit II: Node architecture

The sensing subsystem, Analog to Digital converter, the processor subsystem, architectural overview, microcontroller, digital signal processor, application specific integrated circuit, field programmable gate array (FPGA), comparison, communication interfaces, serial peripheral interface, inter integrated circuit, the IMote node architecture, The XYZ node architecture, the Hogthrob node architecture.

Unit III: Fundamentals of Wireless Digital Communication

Basic components, source encoding, the efficiency of a source encoder, pulse code modulatio n and delta modulation, channel encoding, types of channels, information transmission over a channel, error recognition and correction, modulation, modulation types, quadratic amplitu de modulation, signal propagation.

Unit IV: Frequency of Wireless Communication

Development of Wireless Sensor Network based on Microcontroller and communication device-Zigbee Communication device.

Unit V: Power sources- Energy Harvesting

Solar and Lead acid batteries-RF Energy /Harvesting-Energy Harvesting from vibrationThermal Energy Harvesting-Energy Management Techniques Calculation for Battery Selection.

Text Books: 1. Fundamentals of wireless sensor networks : theory and practice Waltenegus Dargie, Christian Poellabauer, A John Wiley and Sons, Ltd., Publication.

2. Smart Sensors, Measurement and Instrumentation , Subhas Chandra Mukhopadhyay, Springer Heidelberg, New York, Dordrecht London, 2013.

3. Wireless Sensors and Instruments: Networks, Design and Applications, Halit Eren, CRC Press, Taylor and Francis Group, 2006.

Reference Books:

1. Uvais Qidwai, Smart Instrumentation: A data flow approach to Interfacing“, Chapman & Hall; 1st Edn, December 2013.

2. Wireless Sensor Networks: Architectures and Protocols, Edgar H. Callaway Jr. and Ed gar H. Callaway

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: EI-37701 SUBJECT NOMENCLATURE: AGRICULTURE AND ENVIRONMENTAL INSTRUMENTATION (ELECTIVE -I)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Prerequisite: Fundamental knowledge of sensors & transducers, Basic concept of SCADA, PLC andDCS systems

Course Outcomes:

CO1. characterize problems and possible technological solution of agro industries.

CO2. familiarize with current literature, research in agricultural instrumentation.

CO3. analyze and design of automation system by evaluating agricultural parameter measurement constraint.

Unit I: Necessity of instrumentation & control for agriculture and food processing requirement, remote sensing, biosensors in agriculture, standard for food quality. Soil science and sensors: Engineering properties of soil pH, conductivity, resistivity, temperature, soil moisture and salinity, ion concentration measurement, method of soil analysis, Instrumentation for environmental conditioning of seed germination and growth

Unit II: Flow diagram of sugar plant & instrumentation set up for it,flow diagram of fermenter & control (batch process), flow diagram of dairy industry & instrumentation set up for it, Juice extraction control process & instrumentation set up for itOil extraction plant and instrumentation set up for it.Pesticides manufacturing process and control

Unit III: Application of SCADA for DAM parameters & control,Irrigation canal management up- stream & down - stream control systems,Water distribution and management control, Auto drip irrigation systems.

Unit IV: Automation in earth moving equipment & farm equipment.application of SCADA & PLC in packing industry and cold storage systems, implementation of hydraulic, pneumatic & electronics control circuits in harvesters cotton pickers, tractor etc.

Unit V: Green houses & instrumentation: ventilation, cooling & heating, wind speed, temperature & humidity, rain gauge, carbon dioxide enrichment measurement & control.Leaf area length evaportranspiration, temperature, wetness & respiration measurement & data logging, electromagnetic radiations photosynthesis, infrared &UV bio sensor methods in agriculture, agro-metrological instrumentation weather stations,

Text Books:

1. Industrial Instrumentation by D. Patranabis, Tata Mcgraw Hill pub

2. Process control and instrumentation technology by C.D. Johnson, 7th edition, Pearson education
3. Process Instrumentation and control handbook by Considine D. M., McGraw Hill pub.
4. Mineral Processing Technology by Wills B.A., Pergamon Press, 4th Ed.
5. G.S. Sawhney ―Non-Conventional Energy Resources, PHI Learning Private Limited, 1st ed., 2012 **Reference Books:**

1. . Instrumentation Engineers Handbook- Process measurement volume I and Process control volume II, byB.G.Liptak, Chilton Book Company, 2001

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: EI-OC-IV SUBJECT NOMENCLATURE: MATLAB BASED SYSTEM DESIGN

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	1	3	-	3	-	CW	END SEM	SW	END SEM	
						50	-	50	-	100

Pre-Requisite: Knowledge of Basic Fuzzy Logic, Polynomials, Matrix etc

Course Outcomes:-

CO1: To implement the MATLAB Desktop, Command window and the Graph Window
CO2: Be able to do simple and complex calculation using MATLAB
CO3: Be able to carry out numerical computations and analyses
CO4: To apply the mathematical concepts upon which numerical methods.
CO5: Todiscuss the tools that are essential in solving engineering problems

Course content:

Practical on:Introduction to MATLAB: MATLAB Interactive Sessions

Functions & Files

Plotting: XY- plotting functions, Bar Graphs, Area Function, STEM Function, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

Linear Algebraic Equations

Symbolic Processing With MATLAB:

Practical:

List of Experiment:

10. Elementary Operations
11. The command window
12. Vector and Matrices
13. Element by ElementOperations
14. Graphics
15. Scripts
16. Functions
17. Flow Control
18. Symbolic Computation

Text Books:

3. Introduction to MATLAB for Engineers 3RD edition by William Palm III.
4. A Guide to MATLAB: For Beginners and Experienced Users by Brian R.Hunt (Editor), Ronald L. Lipsman, J. Rosenberg.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI-47053 SUBJECT NOMENCLATURE: PROCESSINSTRUMENTATION

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	1	4	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of Sensors and Transducers, Control Systems

Course Outcomes:

CO1: To Analyse process control system and evaluation.
CO2: Application of pneumatic and electronic controller in control systems.
CO3: To describe PLC and ladder programming for designing various logics.
CO4: To discuss final control elements
CO5: Toe employ PLC and ladder programming to real world scenario.

Course Content:

Theory:

UNIT-1. Introduction to process control. Control system Evaluation, Objective. ON-OFF control. Time proportional control, proportional control, Integral control, Derivative control, Typical PID controller characteristics and related terminology.

UNIT-2. Pneumatic controller: P, PD, PI, PID controllers. Hydraulic controller: P, PI, PD, PID controller, Electronic controller. Complex control schemes: ratio control systems, split range controls, cascade controls, feed forward control. Tuning of controllers: Ziegler-Nicolas methods and other methods.

UNIT-3. Introduction to programmable logic controllers: Evolution, basic block diagram, characteristics, advantages, types, PLC Vs PC. Ladder diagram, Ladder design, development of Ladder diagrams for various logic gates, logics. PLC timers and counters, Application of PLCs: Industrial applications.

UNIT-4. Final control elements: Mechanical, Electrical, Fluid valves: control valve principles, valvesport and plug and characteristics, control valve types, Valve sizing and selection. Type of actuators: Pneumatic actuators, Hydraulic actuators.

UNIT-5. Feedback and connecting elements in the loop flow, pressure level and temperature control loops, Pneumatic transmission, electric transmission, Thermal element lag, pressure element lag.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Practical:

List of Experiment:

1. Experiment to obtain Pressure-displacement characteristics of Flapper Nozzle amplifier.
2. Experiment to maintain constant flow of liquid using PID controller (flow control system).
3. Study of feedback flow loop from supervisory station.
4. Experiment to maintain constant liquid level in a tank using PID controller (level control system).
5. Study of feedback level control plant from supervisory station.
6. Study of cascade control system.
7. Study of feedback pressure control system.
8. Control of temperature of heating fluid using PID controller (heat exchanger).
9. Study of PLC based rotary bottle filling system.
10. Study of PLC based On-OFF level control system.
11. Study of PLC based Lift simulator.

Assessment: Evaluation of students through –

Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

Text Books :

1. Eckman- Automatic Process Control.
2. D.Patranabis- Principles of Process Control.
3. Curties D. Johnson- Process Control Instrumentation Technology.

References Books:

1. S. K. Singh - Industrial Instrumentation.
2. Mitra& Gupta- Programmable Logic Controller and Industrial Automation

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE IV Year (4 YDC)

SUBJECT CODE: EE -47055 SUBJECT NOMENCLATURE: VLSI DESIGN

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Prerequisites: Knowledge of Digital Circuit and Basics of Semiconductors are required.

Course Objective: This course presents the fundamental of CMOS VLSI design with different VLSI design methodologies and all aspects of transistor level design. The focus will on the transistor level design and will address all important issues related to size, speed and power consumption.

Course Outcomes:-

CO1: To develop strong understanding of VLSI design methodology.
CO2: To Develop skills of designing digital circuit using VHDL.
CO3: Analyze the static & dynamic characteristics of CMOS inverter.
CO4: To design CMOS Inverter with focus on speed, power and area.
CO5: Implementation of logic functions on basis of different properties such as rise/fall/delay time, fan-in, fan-out etc.
CO6: To design FSM design using Mealy and Moore machines.

Course Content:

Theory:

Unit-1.VLSI design flow. Gajeski's chart, various design approaches: Top-down, Bottom-up & Mixed. PLD based design flow, Synthesis, Simulation, Placement & Routing, Floor planning. Verification, Back-annotation etc.

Unit-2. Introduction to HDLs, their features, HDL based design, Features of VHDL & programming methodologies. Circuit designing with HDL: adders, subtractors, multipliers, decoders, counters, shift registers etc., Test benches. Programmable Logic Devices: PLA, PAL, PROM etc., Programming strategies, Circuit implementation, CPLD & FPGA architectures, Case study of Xilinx 4000/3000 series FPGA & 9500 series CPLDs, their features and programming.

Unit-3. Review of MOS Transistor theory, second order effects, MOS Models, Scaling of MOSFETS, Operation of NMOS, PMOS, CMOS, BiCMOS, VTC, Noise Margins power dissipation, speed, area.

Unit-4. Basics of VLSI Design, implementation of Logic functions, rise time/ fall time/ delay time considerations. Fan-in, fan-out, CMOS logic structures: Domino logic, NP Zipper Logic, CVSL, DVSL.

Unit-5. FSM Design: State machines, Mealy & Moore machines, state diagrams, state table reduction techniques for state tables, transition tables, design of sequential circuits using FSMs, VHDL coding for FSMs.

Assessment: Evolution of students done through -

Assignments, Seminars, Quiz, Mid sem Test exam, class performance & End term exam

Text Books:

1. Weste&Eshraghain-Principles of CMOS VLSI Design
2. Wayne Wolf-Modern VLSI Design, Systems on Silicon.

3. J. Bhasker- VHDL Primer

References Books;

1.C. Roth-Logic Design
2.S. Brown & Z. Vranesic-Fundamentals of Digital Logic with VHDL
3.D.L.Perry-VHDL Programming by Example
4. Smith-Application Specific Integrated Circuits

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE IV Year (4 YDC)

SUBJECT CODE: EE-47002 SUBJECT NOMENCLATURE: POWER ELECTRONICS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	TU	T	P	TU	CW	END SEM	SW	END SEM	
4	2	-	3	1		30	70	40	60	200

PRE- REQUISITE: Basic knowledge of Electronics and semiconductor devices.

COURSE OBJECTIVES:

- To provide students a deep insight in to the operational behavior of practical power switching devices with respect to their static and dynamic characteristics
- To learn the working principle of classified topologies of Thyristor based AC/DC, AC/AC, DC/DC and DC/AC converters.
- To design and analyze the operation of above converters considering their applications.
- To understand design of firing circuits for Thyristor based line commutated converters.

COURSE OUTCOMES:

EE47002(T).1: Acquire knowledge about fundamental concepts and switches used in power electronics

EE47002(T).2: Ability to analyze various single phase and three phase line commutated power converter circuits and understand their applications.

EE47002(T).3: Nurture the ability to identify basic requirements for line commutated converter based design application.

EE47002(T).4: To develop skills to build, and troubleshoot power electronics circuits.

EE47002(T).5: Understand the firing circuit design for line commutated converters

EE47002(T).6: Foster ability to understand the use of line commutated converters in professional engineering.

COURSE CONTENTS:

THEORY:

UNIT: 1

Static power devices: Thyristor family, two transistor analogy of SCR, construction, characteristics, parameters, turn on and turn off methods, firing circuits, isolation and amplifier circuits, synchronization circuits.

UNIT: 2

Converters: AC to DC converters, single phase rectifier circuits with different load, various quadrant operation, basic principle and power circuits of dual converter and cycloconverter

UNIT: 3

DC to DC converter: Basic principle of chopper circuits, various chopper circuits and their working, stepup chopper, performance analysis.

UNIT: 4

Inverters: CSI and VSI inverters, single phase inverters, principle of operation, voltage and frequency control techniques.

UNIT: 5

Industrial Application of Power Electronics, SMPS, UPS, AC and DC drives, Power Supplies.

ASSESMENT:

A. Continuous evaluation through two mid-term test with a weightage of 30% of the total marks. It includes class attendance as well as assignments on the course topics.
B. The end-term theory examination weightage is 70%.

PRACTICALS:

List of Experiments

1. Verification of steady state characteristics of different static switches.
2. Phase control of TRIAC using DIAC and RC circuit in light dimming circuit.
3. Firing pulse generation using UJT based relaxation oscillator.
4. Firing pulse generation for SCR using TCA 785 IC.
5. Performance evaluation of single phase uncontrolled converter for R, RL load.
6. Performance evaluation of single phase controlled converter for R, RL load.
7. Performance Analysis of step down chopper
8. Performance evaluation of current commutation circuit for SCR
9. Performance evaluation of voltage commutation circuit for SCR.
10. Effect of duty cycle on the output voltage of buck-boost converter.

ASSESMENT:

A. Continuous evaluation of laboratory journals with a weightage of 40%. It includes lab attendance as well as experiments performed in the lab.
B. The end-term practical examination weightage is 60%.

TEXT BOOKS RECOMMENDED:

1. M H Rashid, –Power Electronics Circuits, Devices, and Applications‖, third edition Pearson/Prentice Hall, 2009.
2. Ned Mohan, –Power Electronics: Converters, Applications, and Design‖, third edition, John Wiley & Sons Inc, 2007.
3. Joseph Vithayathil, –Power Electronics Principles and applications‖, Tata McGraw-Hill, 1995.

REFERENCES BOOKS:

1. C. M. Pauddar, –Semiconductor Power Electronics (Devices and Circuits)‖, first edition, Jain Brothers New Delhi, 1999.
2. M. H. Rashid, –Handbook of Power Electronics‖, Pearson Education India, 2008.
3. M. D. Singh, K. B. Khanchandani, –Power Electronics‖, Tata McGraw-Hill, 2008.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)

SUBJECT CODE: EI-47257 SUBJECT NOMENCLATURE: FIBER OPTICS & PHOTONICS (ELECTIVE-I)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite: Knowledge of Optical Communication

Course Outcomes:-

CO1: **Impart basic knowledge related Optical Fiber types, its fabrication and various parameter measurement techniques.**

CO2: Gain knowledge about optical instrumentation.

CO3: Apply the skills necessary to solve practical and design problems for fiber optic communication & networking systems.

CO4: Develop a knowledge and understanding of Optoelectronics materials and Photonics Integrated circuits.

CO5: Identify the behavior and functionality of different optoelectronics devices.

Course content:

Theory:

FIBER OPTICS:

UNIT-1. Optical fiber: Various types of optical fiber, Their Attenuation measurement, Numerical Aperture measurement, multiple wavelength measurement, Fabrication of Optical fiber, Cutback method of attenuation measurement.

UNIT-2. Optical Instrumentation: Types of Optical fiber sensors, Intrinsic and extrinsic sensor, measurement of Temperature, Flow, Displacement etc using optical fiber sensors, Optical power meter, OTDR, Optical spectrum analyzer.

UNIT-3. Optical Communication: Optical Transmitter and Receiver, Basic optical data and voice communication, **Optical Networking**, Optical modulators for WDM 40 Gbit/s optical network. New Raman design rules for high speed network.

PHOTONICS:

UNIT-4. Optoelectronic materials (III-V) and Technology: Growth and Characterization of Ternary and Quaternary materials. **Photonic Integrated Circuits: Modeling, Design &development and its**

applications.

UNIT-5. Semiconductor lasers, Light Emitting Diodes: Bandgap Engineering, strained quantum well-laser, Distributed feedback laser, Distributed Bragg Reflector laser, and vertical cavity Surface Emitting Laser, Optical Amplifiers, EDFA, Semiconductor Optical Amplifiers. Advances in photo detector, PIN and APD, MCM etc, Types of LED‘s.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books :

1. Senior M.OpticalFiber Communications, Pearson Education.
2. Gerd Keiser, III Edition, Optical Fiber Communications.
3. Bhattacharya P., Semiconductor Optoelectronic Devices, Pearson Education.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: 47XXX SUBJECT NOMENCLATURE : COMPUTER NETWORKS(ELECTIV-I)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of Data Communication

Course Outcomes:-

CO 1: To Analyse the concepts of networks, types and architectures.
CO2: To Identify error free transmission of data and analyse data collisions with various protocols
CO3: To Apply various routing algorithms over a network to provide optimal path
CO4: Illustrate the real time applications of networks.
CO5: Examine the addressing entities of a network with implementation of TCP, UDP protocols.

Course Content:

Theory:

UNIT-1. Introduction to computer network: Network uses, Hardware and software .Types of network .Structure and architecture. Seven layers OSI reference model & TCP-IP reference model. Services and interfaces. Circuit switching, packet switching and hybrid switching.

UNIT-2. Data transmission and its types, Wireless transmission, Characteristic, Capacity Speed & Delay of transmission, Bandwidth, Data rate, Throughput serial and parallel communication, Synchronous and Asynchronous communication. Simplex and Duplex communication.

UNIT-3. Physical layer: Transmission media, Terminals modems. Digital transmission, switching methods. Multiplexing, Medium access sub layers, Local area networks protocols. IEEE standards 802.3, 802.4 & 802.5.

UNIT-4. Data link layer & network layer .Design issues. Elementary data link protocol, Sliding window protocol. Routing algorithms. Traffic monitoring, Bridge and gateways. ATM, Routing Algorithm: Distance vector routing, Path Vector Routing, Link State routing, Random access methods: Aloha, CSMA/CD, CSMA/CA.

UNIT-5. Design and Performance issues and protocols of Transport layer, Session layer, Presentation layer & Application layer. DNS, SNMP (Simple network management protocol)
.Network security.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books :

1. Tanenbaum A S., Computer networks, 4th Edition, Pearson Education
2. Martin James, Computer Network & Distributed processing, Pearson Education.
3. Gallo, Hancock, Computer Communications and Networking Technologies.

References Books:

1. Behrouz A. Forouzen, Data communication and Networking.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI-47322 SUBJECT NOMENCLATURE: VLSI TECHNOLOGY
(ELECTIVE-II)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite: - Introduction to VLSI Design, Digital Electronics
Course Objective:- .Understand crystal growth and wafer preparation methods. understand various layering in terms of chip fabrication. understand of various patterning methods. knowledge about memories layout design rules, stick diagrams etc
Course Outcomes:-
CO1: To describe crystal growth and wafer preparation methods.
CO2: **To understand different layering & oxidation methods in terms of chip fabrication.**
CO3: **To illustrate various patterning and doping methods.**
CO4: **To Gain knowledge about Floor-planning & EDA tools along with layout design rules, stick diagrams etc.**
CO5: **To discuss various subsystem design and memories.**

Course Content:
Theory:
Unit-1. Crystal Growth and Wafer preparation: Wafer terminology, Different crystalline orientations, CZ method, CMOS IC Design flow, Crystal Defects. Fabrication processes of FETs, MOSFETs, and BIMOS etc.
Unit-2. Layering: Epitaxial growth methods, Liquid phase epitaxy, Vapor phase epitaxy, Molecular beam epitaxy, Oxidation, Types of oxidation, Horizontal and vertical tube furnace for oxidation, Kinetics of oxidation, Thin film fabrication, Metallization; Physical Vapor Deposition, Sputtering.
Unit-3. Patterning: Lithography; Optical Lithography, Electron Lithography, X-ray Lithography, Ion Lithography. Photo masking steps, Resists. Doping: Diffusion; Diffusion Models, Ion Implantation; Implantation Equipment, Channelling.
Unit-4. VLSI process techniques and Integration: Floor planning, layout, Design rules, stick diagrams, Test generation, Logic simulation, Introduction to EDA tools. Contamination Control; Clean rooms, HEPA, ULPA Filters and Class numbers.
Unit-5. Subsystem Design: Data-paths; adder, Shift registers ALU, Memory; NVRWM, Flash memories,6-Transistor RAMs Dynamic RAM, Read Write Cycle, Latch up in CMOS Circuits.
Assessment: Evolution of students done through -
Assignments, Seminars ,Quiz, Mid sem Test exam, class performance & End exam of Session .
Text Books:

1 S.K.Gandhi, VLSI Fabrication principles, Wiley.
2 S.M. Sze, VLSI Technology, II edition, McGraw Hill.
3 P.VanZant, Microchip Fabrication, A Practical Guide to Semiconductor Processing, Third Edition, McGraw Hill.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI-47301 SUBJECT NOMENCLATURE: INTELLIGENT INSTRUMENTATION (ELECTIVE- II)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite: Knowledge of Basics Robotics

Course Outcomes:-

CO1: To discuss concepts of robotics, robot mechanism and its classification.
CO2: To describe mechanical and electrical elements involved in robotics.
CO3: Practical analysis of robotic mechanism and its functioning at different abstraction levels.
CO4: Designing of smart systems and its study in terms of interfacing and intelligent instrumentation.
CO5: To discuss real time systems and its scheduling.
CO6: Evaluation of expert system for real time control applications.
CO7: Brief overview of artificial intelligence and its requirement in instrumentation.

Course Content:

Theory:

Unit-1. Introduction to Robotics: Robot classification, Robot mechanism, Mechanical & Electrical elements. Kinematics: Forward & Inverse Kinematics. Dynamics: Kinetic energy, potential energy, motion equation. Robot Sensors: Range, Proximity, Force, Torque, Ultrasonic, Optical sensors. Vision system: High level, Low level, Medium level vision, Edge detection method, Region growingmethod. Various Actuators: Hydraulic, Pneumatic, Electrical actuators. Principles of programmable robots, multiple robot control & Adaptive robots. Field applications of robot manipulator, Robot simulation & computer control.

Unit-2. Smart Systems: Various techniques of Interfacing with Smart instrumentation systems, Stepper motor Interfacing, Smart cards, Smart buildings, Smart cars etc.

Unit-3. Real time system: Hard & Soft RT'S, static & dynamic scheduling of RT'S e.g. of RT'S like railway reservation system, rocket launching system, pacemaker etc., Programmable Controller & their use in Instrumentation.

Unit-4. Expert system for real time control application. Knowledge base system: facts, rules, frames, inheritance. Fuzzy Logic: crisp logic, fuzzification, defuzzification, mamdani's method.

UNIT-5. Artificial Intelligence & its requirement in Instrumentation: state space problem water jug problem, chess problem, production system, Problem characteristics, searching a tree: Uninformed search, informed search, Prolog programming: Marcus problem, family tree problem.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books:

1. Robotics: Fu, Lee & Gonzalez.
2. Artificial Intelligence: Elaine Rich & Knight.
3. Turbo prolog: Townsend.

References Books:

1. Intelligent Instrumentation: Barney.
2. Patterson, Artificial Intelligence & Expert system, Pearson Education
3. Luger, Artificial Intelligence, Pearson Education

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: BM-47613 SUBJECT NOMENCLATURE: MEDICALINSTRUMENTATION (ELECTIVE-III)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4		-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite:

Course Outcomes:

CO1: Introduction to general human physiology.
CO2: Illustration of measurement of physiological signals from detection to display.
CO3: Understand theory and design aspects of different therapeutic equipments.
CO4: Practical analysis of different therapeutic equipments.
CO5: Gain knowledge about advanced microprocessor and PC based biomedical instruments.
CO6: Perform the analytical experiments; improve analytical skills and attitude which help them to apply these skills in their field of engineering.
CO7: Understand different analytical techniques

Theory:

UNIT-1. Review: general human physiology, generation and transmission of action potential, Depolarization and repolarisation, Evoked potentials. Physiology of heart, heart as pump, various typed of electrodes and their construction, performance and application, bioelectrical signals and their recording. Physiological transducers.

UNIT-2. Measurement and recording of physiology signals: Signal condition and processing circuits for medical recording system. Bedside monitor, ECG machine and cardio scope Blood flow meters, Blood pressure and cardiac output measurement, Measurement of heart sounds, Plethysmography. Patient care and monitoring .central monitoring systems. Electrical safety of medical equipments.

UNIT-3. Therapeutic equipments: pacemakers –Theory and design aspects Defibrillators, Laser applications in biomedical field. Artificial kidney and dialyzers, X-ray machines and competent tomography, Magnetic resonance and Ultrasonic imaging systems, Ultrasound in medicines, Introduction to Thermography.

UNIT-4. Advanced Microprocessor and PC based biomedical instruments. Biomedical Telemetry. Introduction about Body area network,

UNIT-5. Analytical Techniques: Electromagnetic radiation and its interaction with matter. Various components of optical spectroscopic instruments. Laws of spectroscopy. Absorption spectroscopy for UV, Visible and IR region. Various sources and detectors and instrument designs. FTIR and its distinct applications. NMR spectroscopy and X- ray analysis, Ion sensitive electrodes and their measurement Chemistry analyzers. Introduction to Chromatography: Gas & Liquid.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books:

1. Cromwell L., Weilbell F.J and Pfeiffer E.A –Biomedical instrumentation and measurement‖, Pearson Education
2. Khandpur R.S., –Handbook of Biomedical Instrumentation‖, TMH.
3. Carr and Brown, Introduction to medical equipment technology, Pearson education.

References Books:

2. Willard merit & dean, –Instrumental methods of analysis‖

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI-47611 SUBJECT NOMENCLATURE: DIGITAL IMAGE PROCESSING (ELECTIV-III)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: Knowledge of Filter simulation

Course Outcomes:

CO1: Understand the fundamentals of image processing.
CO2: Study of various image transform.
CO3: Study of different filters used in image processing.
CO4: Different types of image reconstruction process.
CO5: Study of coding and algorithms

Course content:

Theory:

UNIT-I Digital Image Processing (DIP) Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system. Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

UNIT-II Image Transforms Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT. Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

UNIT-III Image Enhancement Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method. Frequency domain methods: basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

UNIT-IV Image Restoration Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

UNIT-V Image Compression Fundamentals of data compression: basic compression methods, Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding. Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books:

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.

References Books:

1. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
2. Jayaraman, Esakkirajan and Veera kumar: Digital Image Processing, TMH.
3. William K. Pratt, Digital Image Processing, Wiley Ind.

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI-47776 SUBJECT NOMENCLATURE: AUTOMATION IN INSTRUMENTATION (ELECTIV-IV)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite: Knowledge of Sensor & Transducers

Course Outcomes:-

CO1: Introduction to automation its types and application in instrumentation.
CO2: Develop a good sense of understanding towards computerized automation based instrumentation industry.
CO3: Illustrate the concepts of Microcomputer based numerical control system.
CO4: To analyse evolution of electronic system and instrumentation in terms of automation.
CO5: Illustrate the concepts of Virtual instrumentation with a few case studies.

Course Content:

Theory:

UNIT-1. Automation: Definition of automation, types of automation, merits & demerits, application in instrumentation. Automatic test system configuration: GPIB bus talker/ listener/ controller, IEEE compatible programmable instruments, specification & operation. PC based instrument controller, computer controlled instruments system Programmable oscilloscope. Programmable function generator.

UNIT-2. Automatic performance evolution of electronic system & instrumentation: Data logger, programmable data logger configurations, SCADA & PLC systems. Operation of data logger, applications of data logging systems. Condition monitoring, failure of plants/ components.

Logical fault finding, maintenance logging, vibration monitoring, noise level, thermal sensing, infrared, ultrasonic condition monitoring, Quality control & automated inspection: Sensor technology for automated inspection, machine vision.

UNIT-3. Microcomputer based numerical control system: Types of numerical control machines Part programming. Computer numerical control machine tools.

UNIT-4. Automatic testing of electronic components: Operational amplifier. Digital integrated circuits. Sample & hold circuit/ switches/multiplexers. Instrumentation amplifier Switches in automated test systems. Virtual instruments: Basic components of virtual components, using virtual instruments.

UNIT-5. Case studies: Hardware & software design of Bottle filling plant. Automated guided vehicle system. Automated milk & food processing system.

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books:

1. Kocher A.K. & Burns N.D., Microprocessors & their manufacturing applications
2. Mikell P. Groover, Automation, Production system & Computer integrated manufacturing, Pearson EducationClyde F. C

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE IV Year (4 YDC)

SUBJECT CODE: EI-47701SUBJECT NOMENCLATURE: DATA ACQUISITION SYSTEM (ELECTIVE-IV)

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite: Knowledge of Power management

Course Outcomes:

CO1: Review of Fundamentals of Data Acquisition System.
CO2: Data Acquisition Systems: Hardware & software.
CO3: To discuss about Power Management & Timing System.
CO4: Review of Analog and Digital Signal Processing.
CO5: Design of Data Acquisition Systems.

Course of Contents:

Theory:

UNIT-1 Fundamentals of Data Acquisition Systems, Introduction, Sensors and Transducers, Temperature Sensors, Magnetic Field Sensors, Potentiometers, Light Detection, DAQ Hardware, DAQ Software, Communications Cabling, Noise.

UNIT-2 Data Acquisition Systems: Hardware, Introduction, Plug-in DAQ Systems, Signal Conditioning, Example of Design of a Signal Conditioning Circuit.

UNIT-3 Power Management, Automotive Power-Management MAX16920, Power-Management ICs forSingle-Cell, MAX8662/MAX8663, Timing System, Limitation of RS232, and MAX220-MAX249 for Serial Applications.

UNIT-4 Signal Processing, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT),Frequency Spacing and Symmetry of the DFT/FFT, Power Spectrum, About Spectral Leakage and Smoothing Windows.

UNIT-5 Design of Data Acquisition Systems, Introduction to the Design, Functional Design of High Speed Computer-Based DAS, Requirements, Analysis of Accuracy (Static), Analysis of Accuracy (Dynamic).

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

Text Books:

1. Data Acquisition Systems from Fundamentals to Applied Design, Di Paolo Emilio, Maurizio, Springer, New York
2. Data Acquisition for Sensor Systems, Taylor, H.R, Springer US
3. Practical Data Acquisition for Instrumentation and Control Systems, John Park, ASD, IDC Technologies, Perth, Australia

References:

1. Data Acquisition and Signal Conditioning Course Manual, National Instruments Corporate Headquarters, Texas, USA