ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE- II Year (4YDC)
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
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

Pre-Requisite: Knowledge of basic Electrical engineering

Course Objectives:

1. To Identify and realizes various electrical circuit topologies.
2. Determine time domain and frequency domain responses.

Course Outcomes: - The student will able to:

CO1: Apply KVL and KCL in Electrical Circuits.
CO2: Identify circuit Topology to reduce complexity.
CO3: Apply Fourier series and Laplace transform for circuit analysis and synthesis.
CO4: Apply various network topologies to analyzes and synthesis of various electrical parameters (2-port/ Hybrid/ T/ π)
CO5: To perform time domain analysis of electrical networks.

CO- PO articulation matrix

Circuit Analysis And Synthesis EI 27001												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	2	1									
CO 2	3	2	2									
CO 3	3	2	3	1								
CO 4	3	2	3	1								
CO 5	3	2	3	1								
Average PO	3	2	2.3	1								

Course Content: Theory:

UNIT-1: Basics of electrical Networks

Network elements: E.M.F., Current and Current density, Ideal and practical Voltage and Current Source and their characteristics, source transformations, Power and energy relations, Kirchhoff‘s laws, Current and voltage division, super node and mesh analysis. Fundamental of Ac circuits

UNIT-2: Network Theorems & poly-phase circuit

Superposition, Reciprocity, Thévenin‘s, Norton‘s and Maximum power transfer theorem, Compensation, Tellenge‘s. Millers theorem Δ-Y transformation, Poly-phase analysis, Power relation in AC Circuits, Power factor, Apparent and reactive power, Power triangle, Sinusoidal steady state analysis of RLC circuits,

UNIT-3: Analysis of Coupled Circuits & Resonance

Magnetic coupling, Study of ideal transformer, Dot convention and electrical equivalent of magnetically coupled circuits, Resonance: Series and parallel resonance, bandwidth & electivity, Q-factor, Effect of resistance on frequency response curve, Parallel resonance of RLC circuit.

UNIT-4: Two port network analysis & Network synthesis

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. 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.

UNIT-5: Time Domain Analysis and Frequency domain analysis

Transient and steady state response of electrical circuits, Initial conditions & final condition in circuit elements, step and impulse response, solution to differential equation using Laplace transform. Transform of various singularity functions, Convolutions, initial and final value theorem. Application of Laplace transformation to solve electrical circuits, Integrator and Differentiator circuits. Fundaments of active filters, Integrator and differentiator circuit, knowledge of state-space equations.

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

Course Outcomes (Practical): The student will able to implement and verify:
CO-1: KVL and KCL in electrical circuit (EXP -1)
CO-2: EXP (2 & 3) Thevenin's / Norton's Theorem.
CO-3: EXP (4,5 & 6) Superpostion Theorem , Reciprocity Theorem and maximum power transfer Theorem.
CO-4: EXP (7) design and implement integrator / differentiator and verify the functionality of circuits
CO-5: EXP (4,5 & 8,9,10) to obtain frequency response of series and parallel RLC circuit (with step input and sinusoidal input) & calculate its resonant frequency

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. JohnD.Ryder&CharlesM.ThomsonElectronicCircuits&SystemsPrentice-HallInc.1976
2. Van Valken burg 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. FranklinF. KuoNetwork Analysis &Synthesis WileyToppan2nd.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: FUNDAMENTALS OF MEASUREMENT

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

Pre-Requisite: Knowledge of basic electrical and electronics.

Course Objective: Student will able to identify and classify various techniques and instruments for measurement and their calibrations strategies.

Course Outcomes: Student will able to:
CO1: To classify measuring instruments and their errors
CO2: Illustrate construction and operations of CRO with its measuring application.
CO3: Identify Analog instruments for measuring purpose.
CO4: List & explain measurement techniques for resistance, voltage, current/voltage, phase, frequency, energy& power.
CO5: Classify A.C. bridges for measurement of electrical parameters like inductance, capacitance.

CO- PO articulation matrix

Fundamentals of Measurement EI 27002												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	1		2								
CO 2	3	2		2	1							
CO 3	3	1										
CO 4	3	1		1								
CO 5	3	1	2	1								
Average PO	3	1.2	2	1.5	1							

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.

Unit-3 Analog Instruments:
Electromechanical Analog indicating type instruments, **operating principle, operating force(deflecting, controlling & damping), types of support (suspension, taut suspension, pivot & jewel bearing), control system (gravity control & spring control) Damping system. PMMC, moving iron &**

Electrodynamometer: Ammeters and voltmeters, Extension of instrument range, instrument transformers.

Unit-4 Measurement of low resistances **(voltmeter-Ammeter, potentiometer & Kelvin's double bridge)** voltage, current, phase **(single phase electrodynamometer power factor meter),** frequency **(mechanical & electrical resonance),** power **(electrodynamometer wattmeter)** and energy **(single phase induction type watt-hour meter),** 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 of digital Multimeter and panel meters, Distortion and spectrum analysis.

Assessment: Evaluation of students through - Assignments, Seminars, Quiz, Mid Semester Tests Exam, class performance & End exam of Session.

Course Outcomes (Practical): The student will able to
CO1: To measure amplitude, phase (lissajous pattern) & frequency of unknow signal with CRO & compare with DSO
CO2: Construct & operationalize Analog instruments based on PMMC principle.
CO3: Measure unknown resistance using different methodologies.
CO4: Measure unknown Inductance using Maxwell's, Inductance Bridge, Hay's Bridge, Anderson's Bridge, Owen's Bridge
CO5: Measure unknown capacitance using De- Sauty's Bridge, and Schering's Bridge

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 bands, 5 bands and 6 bands.
8. Study of A.C Bridges (Maxwell's, Inductance Bridge, Hay's Bridge, Anderson's Bridge, Owen's Bridge, De- Sauty's Bridge, and Schering's Bridge).
9. To measure unknown inductance of a coil using Maxwell's Inductance Capacitance Bridge.
10. Study of Digital Storage Oscilloscope.

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

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 (4YDC)
SUBJECTCODE: EI-27003
SUBJECT NOMENCLATURE: ELECTRONIC DEVICES AND CIRCUITS

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

Pre-Requisite: Knowledge of Basic Physics and Basic Electronics.

Course objectives: The student will able to learn and understand the theory of semi-conductor devices and its modeling & applications.

Course Outcomes: At end of course, the students should

CO1: Able to identify the semiconductor type and explain its working principle.
CO2: Able to discuss the working principle of diodes/BJT and their applications.
CO3: Able to develop the models of diodes & & BJT/FET/MOSFET.
CO4: Able to explain the principle of operation of MOSFET & its circuit design.
CO 5: To discuss fabrication techniques for integrated circuits.

CO- PO articulation matrix

Electronics Devices & Circuits EI 27003												
CO	**P0 1**	**P0 2**	**P0 3**	**P0 4**	**P0 5**	**P0 6**	**P0 7**	**P0 8**	**P0 9**	**P0 10**	**P0 11**	**P0 12**
CO 1	3	2	1									1
CO 2	3	2	1									1
CO 3	3	2	1									
CO 4	3	1	1	2								1
CO 5	3	2										1
Average PO	**3**	**1.8**	**1**	**2**								**1**

Course content: Theory:

UNIT-1 Basics of semiconductor devices

Intrinsic & Extrinsic semiconductors, Mobility and Conductivity, Hall effect, E-K diagram, CurrentDensities,Diffusion,Generation&Recombinationofelectron-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, Varactor Diode, Schottky Diode, Tunnel Diode.

UNIT-2 Diode and Transistor circuits

Clippers,Clampers,Clampingtheorem,Rectifiers&filters,Modelofdiode,Bipolarjunctiontransistor (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 and its dual, Thermal run-way, 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 weight age of 30% of total marks. End semester theory exam. Weight age is 70% of total marks.

Practical:

Course Outcomes: At end of lab session, the students should be able to:

CO1: To generate different waveforms using CRO & function generator and to measure parameters like amplitude and frequency.
CO2: To determine VI characteristics for diodes (PN Junction, LED & Zener)
CO3: To apply and perform the Hall Effect on semiconductor to identify their types and concentrations.
CO4: To build, test & obtain the characteristics & parameters of BJT from its input /output variations.
CO5: To build the circuit and obtain characteristics of N Channel MOSFET.

List of Experiment:

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

8. To write Spice codes for various electronics circuits and perform their simulation.

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

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
EI-II Year (4YDC)
SUBJECTCODE: EI-27006/EI27562
SUBJECT NOMENCLATURE: DIGITAL ELECTRONICS

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

Pre-Requisite: Knowledge of Basic Electronic.

Course Objectives: The student will
1. Understand fundamentals of digital electronics.
2. Realize various digital circuits using gates.

Course Outcomes: Student should be able :
CO1: To perform reduction of logical expressions and implement it using logic gate..
CO2: To develop combinational circuits for given application and verify its operation.
CO3: To implement the sequential circuits & differentiate with combinational circuits.
CO4: To analyze memory classification and structure.
CO5: To implement asynchronous and synchronous circuits fall under digital electronics.

CO- PO articulation matrix

Digital Electronics EI 27006 / EI 27562												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	3	2	1								1
CO 2	3	3	2	1								1
CO 3	3	3	2	1								1
CO 4	3	2	1	1	2							2
CO 5	3	2	1	3	3							2
Average PO	3	2.6	1.6	1.4	2.5							1.4

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.

Course Outcomes (Practical): The student will able to build, test & realize

CO1: Truth tables of logic gates & implementation of Boolean logic equations.
CO2: Design combinational circuits for given application and verifies its operation. (Adder/subtractor/convertors)
CO3: Design & verify sequential circuits for given application and verifies its operation. (Mux/Demux/Encoder/Decoder/Flip-flops/counters)

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 Multiplexer.

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.

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
3	-	1	4	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite: **Mathematics-I and Mathematics-II**

Course Outcomes:- Students should be able to:
CO1: Solve linear homogeneous partial differential equation of nth order & their applications.
CO2: Obtain Fourier series expansion of function satisfying Dirichlet condition & FT of elementary fun.
CO3: Apply Laplace Transform to solve second order differential equation involving Dirac delta.
CO4: Solve the problems based on interpolation, numerical differentiation & integration.
CO5: Solve the algebraic, transcendental and simultaneous equation using various numerical methods.

CO- PO articulation matrix

Mathematics-III MA-27014												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	3	3									3
CO 2	3	3	3									3
CO 3	3	3	3									3
CO 4	3	3	3									3
CO5	3	3	3									3
Average PO	3	3	3									3

Course Content: Theory

Unit-1. Advance Calculus: Jacobian's, Taylor's and Maclaurin's Series of two variable, Maxima andMinima 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. Solution of simultaneous algebraic equation: Gauss elimination method, and Gauss Seidel method. Numerical solution of partial differential equations: Taylor's Picard's &Runge-Kutta Method.

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

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, 8 h 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, M udranika Press Calcutta.
4. Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New-Delhi, 2006.

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

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

Pre-Requisite: Basic components and knowledge of basic electronic.

Course Objective: To identify about basic electronic component. To apply colour coding scheme for resistance (Band 4, Band 5 & band 6) To implement methodology for designing PCB (Etching, Drilling & Soldering)

Course Outcomes: Student should be able:

CO1: To identify the basic electronic component.
CO2: To plot 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 & several IC's.

CO- PO articulation matrix

Electronics Workshop EI 27498												
CO	**P0 1**	**P0 2**	**P0 3**	**P0 4**	**P0 5**	**P0 6**	**P0 7**	**P0 8**	**P0 9**	**P0 10**	**P0 11**	**P0 12**
CO 1	3	2	1				1					1
CO 2	3											
CO 3	3	2	2	1			3					2
CO 4	3	2	2	1					3	3	3	2
Average PO	**3**	**2**	**1.6667**	**1**			**2**		**3**	**3**	**3**	**1.67**

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 on Printed circuit Board

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

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
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

Pre-Requisite: - Network Theory, Basic Electronics and Engineering mathematics

Course Objectives: Student should be able to analyze & design

1. BJT and FET based amplifier for required frequency specifications
2. Power efficient amplifiers
3. Amplifiers for various special mathematical operations using integrated circuits.

Course Outcomes: Student should be able to
CO1: To perform the frequency response & gain calculation of single/double stage amplifiers.
CO2: To explain principle of feedback amplifier & oscillators.
CO3: To analyze and apply OP-Amp fundamentals and Op-amp applications.
CO4: To classify & plot frequency response of tuned RF voltage amplifiers.
CO5: To describe the operating principle of Multi vibrators & linear wave shaping circuits.

CO- PO articulation matrix

Analog Electronics EI 27501												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	1	1									
CO 2	3	2	1	1								
CO 3	3	2	2	2								1
CO 4	3	1	1									
CO 5	3	2	2	1								1
Average PO	3	1.6	1.4	1.333								1

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-band width 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, swamping resistor, 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 741,324,308 etc., 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, Introduction to RFICs, Power supplies: Review of regulators using Zener diodes, series and shunt regulators, 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, Effect of Tilt or sage.

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

Course Outcomes (Practical's) : The student will able to design and analyze:

CO1: The frequency responses of different RC coupled amplifiers & calculate their parameters.
CO2: The frequency response of feedback amplifiers & oscillators.
CO3: Various multi-vibrators & observe their output waveform.
CO4: Operational Amplifiers (with calculation of parameters) & implementing/verifying of different applications of Op-amp.
CO5: Frequency response of Tuned amplifiers.

List of Experiment:

1. A 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. 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. A. To design and construct Differential amplifier using BJT (BC107).
   B. To calculate common mode gain & Differential mode gain.
   C. To calculate common mode rejection ratio (CMRR).
8. To design the following using Operational amplifier (IC741) & verify the output response
   - summing amplifier
   - unity follower
   - integrator
   - differentiator
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 & 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
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

Pre-Requisite: Knowledge of fundamentals of measurements.

Course Objectives: The student will able to identify various sensors & transducers for particular applications.

Course Outcomes: - The student will able to:
CO1: To identify role of Sensor and transducers in instrumentation.
CO2: Explain the transducer construction, classification, principle of operation & characteristics.
CO3: Classify the transducers for measurement of force, pressure, vacuum measurement.
CO4: To analyze transducers for measurement of temperature.
CO5: To list the transducers for flow and level measurement.

CO- PO articulation matrix

Sensor & Transducer EI 27551												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	2										1
CO 2	3	2		2	1							
CO 3	3	2		2	1							
CO 4	3	2		2	1							
CO 5	3	2		2	1		2					1
Average PO	3	2		2	1		2					1

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.

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.

Course Outcomes (Practical):- the student will able to perform and measure

CO1: Resistive type transducers.
CO2: Temperature using RTD/ Thermistor/Thermocouple.
CO3: Linear range & sensitivity of Strain Gauge.
CO4: behavior & characteristics of LVDT.
CO5: displacement using capacitive type transducers & their sensitivity.

List of Experiment:

1. To study the characteristics and behavior of a resistive type transducer (potentiometer).
2. To study and use of RTD characteristics using temperature measuring instrument workbench
3. To measure the Strain using Strain Gauge and cantilever assembly.
4. To obtain the linear range of operation of strain gauges.
5. To determine the sensitivity of Strain gauge trainer.
6. To investigate the behavior and the characteristics of LVDT.
7. To calculate the displacement using parallel plate capacitor.
8. To study and use of Thermocouple characteristics using temperature measuring instrument workbench.
9. To measure the sensitivity of Variable area capacitor.
10. To study and use of level sensor for level measurement using level measuring instrument workbench.

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-27XXX
SUBJECT NOMENCLATURE: CIRCUIT DESIGN USING HDL

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

Pre-Requisite: Knowledge of digital logic and design techniques.

Course Objectives:-The student will able to design and simulate digital circuits using hardware descriptive language-VHDL/Verilog.

Course Outcome: The student will able to
CO1: Identify the different features & characteristics of VHDL
CO2: Classify the modeling strategies in VHDL
CO3: Design and simulate various combinational & sequential logic circuits.
CO4: Differentiate the VHDL and Verilog for logic design.
CO5: Classify Programmable logic arrays & devices.

CO- PO articulation matrix

Hardware Descriptive Language EI 27XXX												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	1	1									
CO 2	3	1	1	1								1
CO 3	3	3	2	1								1
CO 4	3	2	2	1								1
CO 5	3	1	1									2
Average PO	3	1.6	1.4	1								1.25

Course Content: Theory:

Unit-II VHDL:- History of VHDL, pros and Cons of VHDL,VDHL, flow elements: Entity, Architecture, Configuration, Component instantiation, package, Library; Hierarchy, Concurrency, Logic and Delay modeling, Architecture of event driven simulators, Syntax and Semantics of VHDL, Variable and signal Types, arrays and attributes. Operators, expressions and signal assignments. Component instantiation.

Unit-II VHDL Modelling: - Dataflow and Structural Modeling: Data flow Modeling, Concurrent Assignment statements, Block statements, Structural Modeling, Component declaration and Instantiation, Generate statements. Behavioral Modeling: Process statement, Loop control statements, multiple processes Signal Drivers.

Unit-III Examples of design using VHDL: - Examples of combinatorial and synchronous logic circuits include flip-flops, counters, registers, memories, tri-state buffers etc.

Unit-IV Introduction to Verilog: - syntax and semantics of Verilog, veriable types, arrays and tables,

operator expressions and signal assignment. Modules, nets and register, few examples of combinational and sequential circuits.

Unit-V designing with programmable logic devices/CPLD/ FPGA: - Programmable logic arrays (PLAs), and other sequential programmable logic devices (PLDs), complex programmable logic devices (CPLDs), Altera FELX 10K series COLDs. Xlinx 3000 series FPGAs, designing with FPGAs Xlinx 4000 series FPGAs.

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

Course Outcomes (Practical): The student will able to:
CO1: Design and simulate the combinational circuit using VHDL
CO2: Design and simulate the sequential circuit using VHDL

List of experiments

1. Write and simulate the VHDL code for logic gets
2. Implement half adder using VHDL
3. Implement full adder using VHDL
4. Implement half subtractor and full subtractor using VHDL
5. Implement full adder by using to half adders.
6. Implement ripple carry adder using full adder in VHDL
7. Implement 2 x 4 and 3x8 decoders using VHDL (structural, data flow and behavioral modeling)
8. Implement 8x3 encoder using VHDL (structural, data flow and behavioral modeling)
9. Implement 4x1 multiplexer using VHDL (structural, data flow and behavioral modeling)
10. Implement 4x2 priority encoder using VHDL
11. Implement verias code converter (binary to grey, grey to binary, BCD to 7 segment display and BCD to excess- 3 code) using VHDL

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

Text/references

1. J. Bhaskar, “VHDL Primer”, Pearson education Asia 2001.
2. Z. Navabi, “VHDL” , McGraw hill international Ed. 1998.
3. S. Palnitkar , “Verilog HDL : A guide to digital design and synthesis”, Prentice hall NJ, USA, 1996.
4. J. Bhaskar, “Verilog HDL Synthesis- A practical primer”, star galaxy publishing (Allentown, PA), 1998.

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
3	-	-	3	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

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:
(Cognitive Level – Understand) – After completion of course, the students will be able to:
CO-1: Explain behaviour of Consumer so as to estimate the demand pattern and demand elasticity for a product.
CO-2: Plan the production; choose appropriate production technology (combination of production factors); and estimate feasible range of production.
CO-3: Analyze the production-cost-profit relation and select the suitable project for investment
CO-4: Estimate price and the equilibrium for a firm/organization in different competitive market situations.
CO-5: Review, summarize and compare the financial statements of an accounting entity and able to
Apply financial ratio technique for financial analysis. Co-6: Explain and illustrate the entrepreneurship and phases of start-up.

Course Content: Theory:
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 analysisNPV, IRR, ARR and payback period method.

Unit3. 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, cournot's oligopoly model of price determination.

Unit4. Entrepreneurship and entrepreneur, entrepreneurship and start-up, characteristics of an entrepreneur, forms of business organization, phases of startup, small cottage and large scale enterprises, entrepreneurship opportunities in India. Factors of development of entrepreneurship, Entrepreneurial Motivation Concept, Major Entrepreneurial Competencies.

Unit5. Accountancy: Accountancy and bookkeeping, GAAP, Assets, Liabilities and Capital, types of accounts, Journal, Ledger, Trial Balance and Financial Statements, Financial Ratio Analysis.

Books & Reference Recommendation:
- Jhingan M.l ., Economics of development and Planning, Vrinda Publication (40ThEd./latest).
- Ahuja H. L., Advance economic theory, S Chand Publication, (21stEd./Latest)

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
3	-	1	4	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

Pre-Requisite: Basic Mathematics
Course Outcomes:-

CO1: Solve engineering problems using complex variable technique such contour integral & trans.
CO2: Apply concept random variables in one and two dimensions and its distribution.
CO3: Apply concepts stochastic process, Markov chain and their applications.
CO4: Apply concept of reliability & maintainability for quality improvement in electronics system.
CO5: Apply concept of graph theory & Solve minimal weight & shortest path problems using algorithms .

CO- PO articulation matrix

Mathematics-III MA-27563												
CO	**P0 1**	**P0 2**	**P0 3**	**P0 4**	**P0 5**	**P0 6**	**P0 7**	**P0 8**	**P0 9**	**P0 10**	**P0 11**	**P0 12**
CO 1	3	3	3									3
CO 2	3	3	3									3
CO 3	3	3	3									3
CO 4	3	3	3									3
CO5	3	3	3									3
Average PO	**3**	**3**	**3**									**3**

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, Birth and Death Process.

Unit-4. Reliability: Basic concepts, Failure law, Bath Tub Curve, Evaluation of Reliability of a component 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

Assessment: Evolution of students done through -

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

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
EI-II Year (4YDC)
SUBJECTCODE: EI-279992
SUBJECT NOMENCLATURE: SOFTWARE WORKSHOP LAB

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

Pre-Requisite: Basic analog & digital circuits, Polynomials, Matrix etc.

Course Objective: The student will able to simulate the electronic circuits.

Course Outcomes: - The student will able to:
CO1: To implement the MATLAB Desktop, Command window and the Graph Window
CO2: Perform mathematical and logical calculation using MATLAB
CO3: Apply and analyze numerical computations.
CO4: Discuss the tools that are essential in solving engineering problems

CO- PO articulation matrix

Software Workshop EI 27992												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	3	2	1	3							
CO 2	3	2	1	1	2							
CO 3	3	2	1	1	2							
CO 4	3	2			3							1
Average PO	3	2.25	1.333	1	2.5							1

Course content: Practical's 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**

List of Experiment:

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

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

Text Books:

1. Introduction to MATLAB for Engineers3RD 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
EI-II Year (4YDC)
SUBJECTCODE: EI-27881
SUBJECT NOMENCLATURE: VALUES, HUMANITIES & PROFESSIONAL ETHICS

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

Pre-Requisite: NIL

Course Objective:

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 is governed.
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), Quizzes/Tests (30) and Presentations (20) will be awarded against the assessment done throughout 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 of India, New Delhi, 2004

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: IT37005
SUBJECT NOMENCLATURE: DATA STRUCTURES

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

Pre-Requisite: Basic computer

Course Objective: Understand data structure stack queues, lists, trees, complexity etc. in detail. Study memory hierarchy, management techniques partitioning, segmentation, paging and comparison of techniques.

Course Outcomes:- Student should be able to:
CO1: Define the data structure & solve problems involving stack queues, lists, trees.
CO2: Explain the concept of memory hierarchy, management techniques partitioning, segmentation, paging and comparison of techniques.
CO3: Explain the CPU scheduling and multiprogramming
CO4: List the file systems and its organization.
CO5: Case studies on MS-DOS, UNIX and WINDOWS NT.

CO-PO Articulation Matrix

Data Structure IT37005												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	2	1	-	-	-	-	-	-	-	-	1
CO 2	3	3	1	2	2	-	-	-	-	-	-	1
CO 3	3	3	2	2	-	-	-	-	-	-	-	1
CO 4	3	2	2	-	-	-	-	-	-	-	-	1
CO 5	3	2	2	-	-	-	-	-	-	-	-	1
Average PO	3	2.4	1.6	2								

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, Multi-core 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. Weight age is 70% of total marks.

Text Books:

1. A. Silsberschatz & Peter Galvin, "Operating system & concepts, 10th edition, Wiley
2. Achyut S. Godbole, "OS & core studies of UNIX & WINDOWS NT, third edition, McGraw Hill.
3. Langsum, A.Tannenbaum, "Data structure using C/C++", Second edition, Pearson Education

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
3	2	0	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: - Digital electronics, microcomputer basics

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:-Student will able to:

CO1: Explain origin of microprocessor family and architecture of 8085 microprocessor.
CO2: Design & implement assembly language programming of 8085 microprocessors.
CO3: Implement I/O device /peripheral sub-systems interfacing with microprocessor.
CO4: Identify basic building blocks microprocessor and explain operation of microprocessors – 8086.
CO5: Differentiate basic microprocessor with advance RISC based microprocessors

CO-PO Articulation Matrix

Microprocessor Systems EI 37006												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	1	1									
CO 2	3	2	1	1								
CO 3	3	2	2	2								1
CO 4	3	1	1	1								1
CO 5	3	2	2	1								2
Average PO	3	1.6	1.4	1.25								1.333333

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**, Introduction of other supporting ICs:** USART 8251, keyboard controller 8279, and direct memory access data transfer (DMA) **controller 8237**, 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, **Pipelining in 8086 microprocessor.**

UNIT-V: Introduction to Advance Microprocessor

RISC and CISC Architecture, **Evolution of ARM Processor**, Fundamentals, **ARMv7 :Introduction,** Registers, Current program status register**,** Interrupt and the vector table **, Pipelining :3 stage and 5 stage** . Introduction of SUN Sparc Microprocessor.

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. Weight age is 70% of total marks.

Course Outcomes: Practical: Student will able to:

CO1: **Able to understand and use trainer kit (M85-03).**
CO2: Analyze, design, and simulate program **of 8085 microprocessor in assembly language .**
CO3: Able to identify the features of software**like GNU8085**

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: Evaluation of students done through – **Based on** 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
4. A. K. Ray & K. M. Bhurchandi: Advanced Microprocessors and Peripherals

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

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	0	3	1	-	CW	END SEM	SW	END SEM	
						30	70	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.

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.

CO-PO Articulation Matrix

Control System EE37003												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	1	3	2	2	1							
CO 2		3	2	2								
CO 3		3	2	2	1							
CO 4			2	2	1							
CO 5		3			1							
Average PO	1	3	2	2								

Course Content: Theory:

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 - Error detectors, 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 Eigenvectors, 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 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.

3. 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.

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.

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.

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: EC-37014

SUBJECT NOMENCLATURE: ANALOG & DIGITAL COMMUNICATION

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	0	3	--	-	CW	END SEM	SW	END SEM	
						30	70			100

Course Outcomes:-

CO1: Conceptualize 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.
CO5: Realization of digital communication system

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.

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. Weight age is 70% of total marks.

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) PROGRAM ELECTIVE-I
DEPARTMENT OF COMPUTER ENGINEERING
CO37253: ARTIFICIAL INTELLIGENCE

PERIODPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTALMARKS
3	-	-	3	-	-	CW	ENDSEM	SW	ENDSEM	100
						30	70	-	-	

Prerequisite:- Nil
Course Objectives: To enable students to learn basic concepts, theories, applications and techniques of Artificial Intelligence and machine learning.

Course Outcomes: - The student will able to:
CO1: Differentiate between Human and Artificial Intelligence .
CO2: Apply knowledge representation using logic and rules and reasoning.
CO3: Describe the basics of machine learning and performance parameters.
CO4: Elaborate the principle and application of regression and SVM and practice the training using the said method.
CO5: Classify and examine the process of decision trees and dimensionality reduction in Machine learning.

CO-PO Articulation Matrix

Artificial Intelligence CO37253												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	2	1									
CO 2	2	1	2	1								
CO 3	3	2	2	1								1
CO 4	3	2	1	1								1
CO 5	2	2	2	2								1
Average PO	2.6	1.8	1.6	1.25								

UNIT-1: Introduction to Artificial Intelligence (AI) and Problem-Solving Agent:
AI Fundamentals: - Definition, Comparison between Human Intelligence and Artificial Intelligence, Types of AI techniques, Characteristics of AI applications, Intelligent Agents, Agents & Environment, Nature of Environment, Structure of Agents, Goal-Based Agents, Utility-Based agent s, Problem-Solving, State Space Search and Heuristic Search Techniques.

UNIT-2: Knowledge and Reasoning:
Representations and Mappings, Approaches to Knowledge Representation, issues, First Order Predicate logic, conversion to clause form, resolution, algorithm, forward and backward reasoning, Semantic Nets, Conceptual Dependency, frames and scripts, Statistical reasoning, Bayes Theorem and Rule-based system.

UNIT-3: Machine Learning (ML)
Introduction to Machine Learning: Importance of Machine Learning, Types of Machine Learning. Training, validation and testing of machine learning model, Performance Measures: Confusion Matrix, Precision and Recall, Precision/Recall Tradeoff, The ROC Curve, R-squared.

Unit 4. Regression & Support Vector Machines (SVM)
Linear Regression, Cost function, Gradient Descent, Problem of over fitting, Bias-Variance tradeoff, and Logistic Regression. Support Vector Machines: Linear SVM Classification, Case Study 1- Predicting Atrial Fibrillation using the ECG data.

Unit 5. Decision Tees & Dimensionality Reduction
Decision Tees: Decision Tree model, Measuring Purity and information gain, Learning process, Computational Complexity, Regularization, Regression tree, Random Forests and XGBoost. Dimensionality Reduction and Unsupervised learning: Principal component analysis, Clustering algorithms, Partition based, Hierarchical based, Divisive clustering, Optimization objective, Expectation-maximization algorithm-Case Study 2 – Defect detection in manufacturing with unsupervised learning.

Text Books:

- Rich & Knight, "Artificial Intelligence", 2nd Edition, Tata Mcgraw Hill.
- Stuart Russell and Peter Norvig, Artificial Intelligence- A Modern Approach, Third Edition Prentice Hall Series, 2010.
- AurelienGeron, Machine Learning with Scikit-Learn & TensorFlow, O'Reilly USA, 2017. Education India.

Reference Books:

- Andreas Muller and Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O' Reilly, 2016
- Dan W Patterson, Introduction to Artificial Intelligence and Expert Systems, 1st Edition, PHI.,2015

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: IP-37251 (PROGRAM ELECTIVE-I)
SUBJECT NOMENCLATURE: INDUSTRIAL ENGINEERING & MANAGEMENT

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

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

Course Content: Theory
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.

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. Weight age is 70% of total marks.

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 (PROGRAM ELECTIVE-I)
SUBJECT NOMENCLATURE: INSTRUMENT SYSTEM DESIGN

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	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

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

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
0	4	0	-	2	-	-	-	40	60	100

Pre-Requisite: Basic Instrumentation

Course Objective: To learn Different Types Methods for Calibration, Find out Errors in any instrument etc.

Course outcome: Student should able to:
CO1: Calculate & measure static and dynamic characteristic of measurement system
CO2: Discuss concepts of testing of measuring Equipments.
CO3: Analyzing the errors of the electronic equipments.
CO4: Calibrate test equipments.

CO-PO Articulation Matrix

Test & Calibration EI37481												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	1	3	1									
CO 2	1	1	1	--	--	--	--	--	--	1	2	1
CO 3	--	--	3	3	1	2	--	--	1	2	3	2
CO 4	--	1	1	3	2	3	--	--	3	2	3	2
Average PO	1	1.6667	1.5	3	1.5	2.5			2	1.6667	2.6667	1.6667

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's: List of Experiment:

1. Study of static and dynamic characteristic of measurement system

2. Testing of active and passive and active component with CRO and multimeter.
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: Evolution of students done through - Best one experiment performance, internal viva, external viva, File preparation and submission

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: EI-37482
SUBJECT NOMENCLATURE: INTERNSHIP EVALUATION

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
0	4	0	-	2	-	-	-	40	60	100

Pre-Requisite: NIL

Course Objective: The student will able to signify the content of theory to the current scenario of industrial works and also find exposure to projects and their handlings.

Course outcome: Student should able to:
CO1: Explore career alternatives prior to graduation.
CO2: Develop work habits and attitudes necessary for job success.
CO3: Identify, write down, and carry out performance objectives
CO4: Develop communication, interpersonal and other critical skills in the job interview process.

CO-PO Articulation Matrix

Internship Evaluation -1 EI37482												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	1	3	1									
CO 2	1	1	1	--	3	2	--	3	--	1	2	1
CO 3	--	2	3	3	1	2	3	2	1	2	3	2
CO 4	2	1	1	3	2	3	--	--	3	2	3	2
Average PO	**1.3333**	**1.75**	**1.5**	**3**	**2**	**2.3333**	**3**	**2.5**	**2**	**1.6667**	**2.6667**	**1.6667**

ELECTRONICS &INSTRUMENTATION DEPARTMENT

BE III Year (4YDC)

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
						CW	END SEM	SW	END SEM	
3	2	0	3	1	-	30	70	40	60	200

Pre-Requisite: Knowledge of Op-amp, simple mathematical approach

Course Objective: student will able to gather the detailed designing & implementation of Various types of filters.

Course Outcomes:-Student will able to:

CO1: Realize various active network elements, filters & plot frequency response and bode plot using design equations

CO2: Evaluate transfer function of Elliptical, Butterworth and Cauer filters using approximation theory.

CO3: To implement realize & simulate Butterworth filters up-to second order using Op-amp.

CO4: Analyzing active networks using different approaches & its implementation using matrix

CO5: To realize LC ladder, Kerwins circuit and other passive filter circuits

CO-PO Articulation Matrix

Filter Design & Simulation EI37511												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3	2	2	1	1	--	--	--	--	--	--	--
CO 2	2	3	2	2	1	--	--	--	2	--	--	--
CO 3	3	2	3	1	1	--	--	--	1	--	--	--
CO 4	2	2	3	1	1	--	--	--	1	--	--	--
CO5	2	2	1	1	--	--	--	--		--	--	--
Average PO	2.4	2.2	2.2	1.2	1				1.3333			

Course Content: Theory:

UNIT-1.

Active Network elements and its Two-port representation, Asymptotic Bode plot for first and second order filter. Frequency responses .realization of design equations Transconductance amplifier and current conyeyors. Switched capacitor filter. and Filter ICS

UNIT- 2 Fundamentals of approximation theory, Butterworth‘s and Chebyshev approximation Introduction to elliptical filter Comparison of various approximation .Design parameters of active filter.

UNIT- 3 Realization of Butterworth‘s filters of first order& second order using Op-Amps. Active Lowpass, High pass, All pass, Band pass and Band reject type of filters. LP-HP transformation Active resonant band pass filters and Friend’s circuit, Gainboost&Gain Dip circuit. Introduction to Delay filters. Sallen and Key filters and their realization, simulator software .various Design parameter. selectivity and sensitivity .

UNIT4

Analysis of Active networks using IAM approach, reduction of multipole and its implementation. parallel connections of multipoles, analysis of Transmission zeros for networks containing active elements like operational amplifiers. Voltage-feed-forward and component-lifting. scaling. properties and circuits of GIC,NIC,CNIC &VNIC Gyrators, FDNR & FDN Cusing Op-Amp

UNIT- 5 Application of Passive filters LC ladder simulation, cascade realization, Kerwin's circuit, constant K-filters and their analysis, M-derived filters, composite filters, attenuators

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. Weightageis 70% of total marks.

Course Outcomes (Practical):-Student will able to implement and verify frequency response of
CO-1: Low Pass & High pass filters
CO2: Band Pass & All pass filters
CO3: Second order Low Pass & High pass filters
CO4: Notch and band Reject Filters
CO5: Chebyshev 2nd order Low pass & other various filter topologies.

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. To study 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.

Text Books:

1. TemesG.C.andLapatraJ.W.,CircuitSynthesisandDesign.
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 (4YDC)

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	
3	0	0	3	0	-	30	70			100

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

Course Objectives: At the end of course student must able to

1. Discuss and relate the mathematics & modeling of waveguides & transmission lines.
2. Elaborate the working of high frequency devices.

Course Outcomes: The students will able to:

CO 1: To interpret and apply Maxwell's equation & wave equation for RF circuits.
CO 2: To differentiate lossy, lossless and distortion less transmission lines.
CO 3: To apply concept of impedance matching in transmission line.
CO 4: Classify the waveguides and their modes of excitation.
CO5: To discuss working principle and operation of high frequency components like Magnetron, Klystron & TWT.

CO-PO articulation matrix

High frequency Engineering EI37513												
CO	P0 1	P0 2	P0 3	P0 4	P0 5	P0 6	P0 7	P0 8	P0 9	P0 10	P0 11	P0 12
CO 1	3											
CO 2	3		1									
CO 3	3	2	1	1								
CO 4	3	2	1	1								1
CO5	3	2										1
Average PO	3	2	1	1								1

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 semiconductor devices. Klystron, Magnetron and TWT. Microwave instrumentation in air traffic control. 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, 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. Jordan E.C., "EM Fields and wave propagation systems, 2nd edition, Pearson Education.
2. Edward F Kuester, "Theory of Waveguides and Transmission Lines" 1st Edition, CRC Press
3. N. N. Rao, Elements of Electromagnetism, 2nd edition, Pearson Education

References Books:

1. K. D. Prasad, "Antenna and Wave Propagation, 3rd edition, Satya Prakashan, New Delhi

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE III Year (4 YDC)
SUBJECT CODE: EC-37562/37512
SUBJECT NOMENCLATURE: DIGITAL SIGNAL PROCESSING

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

Pre-Requisite: Nil

Course Outcomes:-
After completing this course, the student will be able to:

CO1 Learn characteristics of signals & systems and evaluation of DTFT
CO2 Gain knowledge of Z-transform & analyzing discrete system using Z-transform.
CO3 Evaluation of DFT & FFT and its computation
CO4 Realization and Implementation of digital filters
CO5 Designing digital filters & their implementation.

CO-PO Articulation Matrix

Digital signal Processing EC37562/37512												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2		-	-	-	1	--	--	--
CO2	3	3	3	3	1	-	-	-	2	--	--	--
CO3	3	3	3	3	1	-	-	-	2	3	2	2
CO4	3	3	3	3	1	-	-	-	2	3	2	2
CO5	3	3	3	3	1	-	-	-	2	3	2	2
Average PO	3	3	2.8	2.8	1	-	-	-	1.8	3	2	2

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:

1. Schaum's Outline Series, Digital Signal Processing.
2. Ludeman L.C., Fundamentals of DSP, John Wiley.
3. Farooq Husain, DSP and its Application, Umesh Pub, New Delhi.

ELECTRONICS&INSTRUMENTATION DEPARTMENT

BE III Year (4YDC)

SUBJECT CODE: ME37502

SUBJECT NOMENCLATURE: MECHANICAL MEASUREMENT

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	0	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Pre-Requisite: NIL

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: EI37701 (Program Elective-II)
SUBJECT NOMENCLATURE: MICROCONTROLLER & EMBEDDED SYSTEM

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

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

Course Objective: The student will able to:
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 Outcomes: The student will able to:
CO 1: Differentiate between general purpose & application specific processors.
CO2: To draw timing diagrams for particular execution of instruction, interrupts and in different scenarios.
CO3: Illustration applications and design of microcontroller (8051) based system.
CO4: Identify functional units of embedded system, its characteristics and applications.

CO5: To discuss various software architecture of embedded systems &RTOs.

CO-PO Articulation Matrix

Microcontroller & Embedded System (EI37701)												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2										1	
CO2	2	1	2	1	1	1			1	2	2	1
CO3	1	2	3				1			2	1	2
CO4	1	2	1		1		1				1	1
CO5	2	2	3	1	1	1	1		1	2	3	1
Average PO	1.6	1.75	2.25	1	1	1	1	0	1	2	1.6	1.25

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 syste**ms**
Block diagram and Types, characteristics & scheduling.

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. 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

TextBooks :
1.Muhammad Ali Mazidi, Janice Gillispie Mazidi, "The 8051 Microcontroller and embedded systems
2. Douglas Hall, "Microprocessor and Interfacing, Programming and Hardware, McGraw Hill.
3. Daniele Lacamera, "Embedded System Architectures, 1st edition, Packt Publications
4. Jonathan.W.Valvano, Embedded Microcomputer Systems" Brooks- Cole Publishers.

ReferencesBooks;
1.David E. Simon, "An Embedded software premier, 1st edition, Addison-Wesley.

ELECTRONICS & INSTRUMENTATION DEPARTMENT BE III Year (4 YDC)

SUBJECT CODE: EI-37xxx (Program Elective-II)

SUBJECT NOMENCLATURE: SMART SENSORS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	-	0	3	--	-	30	70			100

Pre-requisite: Nil

Course Objectives: The student will able to demonstrate & explain the smart sensing elements & devices with applications

Course Outcomes: Students should be able to

CO1 Explain the principle of operation of different sensors and their applications
CO2 Identify the recent trends in sensor technologies.
CO3 List and identify sensors for wireless network, home automation and robotics.
CO4 Develop the logics of intelligent sensing system.
CO5 Design and model sensing systems and optimize the system.

CO-PO articulation Matrix

Smart Cities & Instrumentation Engineering (EI37xxx)												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1									
CO2	3	1	1	1								1
CO3	3	1	1	2								1
CO4	3	2	2	1								1
CO5	3	2	1	1								1
Average PO	3	1.5	1.2	1.25								1

Unit -1

Introduction to smart sensors, Principles of operation, design approach, interface design, configuration supports, Sensors Fundamental: Sensor classification, Thermal sensors, Humidity sensors, Capacitive sensors, Electromagnetic sensors, Light sensing technology, Moisture sensing technology, Carbon dioxide (CO2) sensing technology, Sensors parameters, Selection of sensors

Unit -2

Electro-analytical Sensors Introduction, Electro-chemical Cell, Cell potential, Sd. Hydrogen Electrode (SHE), Liquid Junction and Other potentials, Polarization, Reference Electrodes, Sensor Electrodes, Electro-Ceramics in Gas Media. Analyzers for different gas and laboratory testing of chemicals

Unit -3 Sensor Communication and MEMS:

Wireless Sensing Techniques: Wireless Sensor, principle and working, wireless sensing network, protocols used, Application of wireless sensor for weather monitoring. Communications for smart sensors – sources and standards and building automation, home automation, protocols in silicon, other aspects of network communications. Sensor technologies: MEMS sensor, Comparison between MEMS and Macro sensor, Fabrication and packaging issue in sensor design Thick film and thin film technique Physical sensors. Bio sensor, Silicon sensor, RF Sensor, sensors for robotics

Unit -4

Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing& self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.

Unit -5

Design and modelling issue in advanced sensing technique. Introduction of different mathematical tools used in sensor design. Optimization techniques used in sensor design. The role of PCA, LDA, Neural network in designing sensor array

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. Weight age is 70% of total marks.

Text Books:

1. Sensors and Transducers, by D. Patranabis. 2nd Edition
2. Electrical & Electronics Measurements and Instrumentation by A.K Sawhney, Dhanpat Rai & Sons.
3. Transducers and Instrumentation, by Murthy D. V. S., Prentice Hall, 2nd Edition, 2011.

Reference Books:

1. Sensor and signal conditioning by John G. Webster, Wiley Inter Science,2nd edition, 2008

ELECTRONICS & INSTRUMENTATION DEPARTMENT

BE III Year (4 YDC)

SUBJECT CODE: EI-37991

SUBJECT NOMENCLATURE: MINI PROJECT

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: Nil

Course Objectives: The student will able to implement & verify their functionality the basic and microcontroller based projects

Course Outcomes: The students will able to:

CO1: Layout Design through PBC Design Software

CO2: Design Microcontroller based electronic circuit

CO3: To interpret data sheets & specifications of various logic families & IC‘s

CO4: Able to Interface sensors with controllers

CO-PO articulation Matrix

Mini Project EI37991												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1									
CO2	1	1	1							2	2	1
CO3			1	3	1	1			1	2	3	3
CO4		1	1	3	1	1	2	1	2	2	3	3
Average PO	1	1	1	3	1	1	2	1	1.5	2	2.667	2.333

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

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

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

Course Objectives: The student will able to analyse and apply various controllers in controlling units. They would be able to realize real world feasibility and applicability of PLC.

Course Outcomes: Student should able to

CO1: To Analyze process control system and evaluation.
CO2: Explain the application of pneumatic, hydraulic & controller in control systems.
CO3: To describe PLC and ladder programming for designing various logics.
CO4: To discuss final control elements.
CO5: To employ PLC and ladder programming to real world scenario.

CO-PO Articulation Matrix

Process Instrumentation EI47053												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		**2**			1					1
CO2	3	2	1	**3**	**2**							2
CO3	3	1		2	**1**							2
CO4	3	2	1	1	1							
CO5	3	2	**1**	**2**	**3**		**1**					2
Average PO	**3**	**1.8**	**1**	**2**	**1.75**		**1**					**1.75**

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,valve sport and plug and characteristics, control valve types, Valve sizing and selection. Type of actuators: Pneumatic actuators, Hydraulic actuators.

UNIT5. Feedback and connecting elements in the loop flow, pressure level and temperature control loop, 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. Weight age is 70% of total marks.

Course Outcomes -Practical: The student will able to

CO1: To analyze Pressure-displacement characteristics.
CO2: Implementation of PID controller in controlling Flow and level systems.
CO3: To employ PLC and ladder programming to real world scenario.

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. Beckman- 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: EI-47055
SUBJECT NOMENCLATURE: VLSI DESIGN

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

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

Course Objective: The student will able to design and implement digital circuits & expressions using CMOS.

Course Outcomes:- The student will able to:
CO1: Explain importance of MOS transistor in designing VLSI circuits.
CO2: To design and analyse CMOS inverter with respect to Speed, Power and area constraints.
CO3: Implement different CMOS logic structures like Domino & Zipper logic.
CO4: To FSM using Mealy and Moore machines.
CO5: To classify memory systems and differentiate between custom and semi-custom design.

CO-PO Articulation Matrix

VLSI Design EI47055												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										
CO2	3	2	2	**2**	**3**							2
CO3	3	3		2	**2**							
CO4	3	2	2	2	3							
CO5	3	3	**2**	**2**	**2**							
Average PO	3	2.2	2	2	2.5							2

Course Content: Theory:

Unit-1. Review of MOS, PMOS, NMOS, MOS device design equations, Short Channel and Narrow Channel Width Effects. MOS small signal and Large signal model, MOS capacitances .Technology Scaling.

Unit-2. Basics of CMOS: Analysis of different types of inverter circuit, CMOS inverter, transfer characteristic, calculation of propagation delay, rise time, fall time, noise margin and power dissipation for CMOS Inverter. Effect of threshold voltage and supply voltage on Delay and power dissipation.

Unit-3. CMOS logic structures: Domino logic, NP Zipper Logic, CVSL, DVSL**.** Basics of VLSI Design, implementation of Logic functions, rise time/ fall time/ delay time considerations. Fan-in, fan-out, standard cell design, cell libraries.

Unit-4. 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.

Unit-5. Memory based subsystem design, Static RAM, Dynamic Ram, **Full custom and Semi-custom design,** Clocking strategies, Clocked system, Latch and Resistors, System timing, two phase clocking, four phase clocking

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. Weight age is 70% of total marks.

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 (ELECTIVE IV)

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

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.

CO-PO Articulation Matrix

Power Electronics EE47002 (Theory)												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	1	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-
Average PO	3	3	3	1								

Course Content: 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 cyclo-converter

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.

Assessment:

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 weight age is 70%.

Practicals:

OBJECTIVES: Following are the objective of the course:

1. Show awareness about operating behaviour of various static switches used in converters.
2. Understand the basic requirements in design of power converters.
3. Analyse performance parameters of various power converters.

.

LABORATORY OUTCOMES: Students will be able to

EE42007 (P).1: Recognize the functions of CRO, identify and select proper instruments to observe and record performance on different experimental set ups of power electronics laboratory.

EE42007 (P).2: Establish wiring and device connections to assemble experiments of static switches, line commutated, DC-DC converters and record their performances.

EE42007 (P).3: Analyze and compare the performance of various firing pulse generation circuits for triggering and Commutation circuit of SCR .

EE42007 (P).4: Apply professional quality textual and graphical tools to sketch and computing results, incorporating accepted data analysis and synthesis methods, mathematical software, and word-processing tools.

EE42007 (P).5: Ability to work in individual and in group following engineering practices. Ability to interact effectively on a social and interpersonal level, divide up and share task responsibilities to complete assignments.

List of experiments:

Experiment no.	Objective	CO	PO	BTL
1.	Verification of steady state characteristics of different static switches.	1, 2,	1,3,4,5, 6,9	3
2.	Phase control of TRIAC using DIAC and RC circuit in light dimming circuit.	1, 2, 4	1,3,4,5,6,8 , 9,	3
3.	Firing pulse generation using UJT based relaxation oscillator..	1, 3, 4	1,2,4,5,6,8 ,9,10	4
4.	Observe the performance of a TCA-785 based triggering circuit used for single phase controlled converter.	1, 3, 4	1,2,4,5,6,8 ,9,10	3
5.	Performance evaluation of single phase uncontrolled converter for R, RL load.	1, 2, 4	1,3,4,5,6,8 , 9,	4
6.	Performance evaluation of single phase controlled converter for R, RL load..	1, 2, 4	1,3,4,5,6,8 , 9,	4
7.	rformance Analysis of step down chopper	1,2,4 ,5	1,2,3,4,5, 6,7,8,9,	4
8.	Performance evaluation of current commutation circuit for SCR	1,3,4,5	1,2,4,5,6, 7, 8,9,10	4
9.	Performance evaluation of voltage commutation circuit for SCR	1,3,4,5	1,2,4,5,6, 7, 8,9,10	4
10.	Effect of duty cycle on the output voltage of buck-boost converter.	1,2,4,5	1,3,4,5,6, 7,8, 9,	3

ASSESMENT:

A. Continuous evaluation of laboratory journals with a weightage of 30%. It includes lab attendance as well as experiments performed in the lab.
B. The end-term practical examination weightage is 70%.

CO-PO Articulation Matrix (Practical)

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	3	-	3	3	2	-	-
CO2	3	-	3	3	3	3	-	3	3		-	-
CO3	3	2	-	3	3	3	-	3	3	2	-	-
CO4	3	2	3	3	3	3	-	3	3	2	-	-
CO5	3	-	-	3	3	3	-	3	3	-	-	-
Average	3	2	3	3	3	3	-	3	3	2	-	-

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 (4YDC)
SUBJECT CODE: EI-47257 (Program Elective I)
SUBJECT NOMENCLATURE: FIBER OPTICS & PHOTONICS

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

Pre-Requisite: Knowledge of Optical Communication

Course Objectives:- The student will able to characterize and realize the applications of fiber optics & concept behind Photonics

Course Outcomes:- The student will able to:
CO1: To identify modes in optical fibers and define attenuation dispersion optical fibers and also identify numerical aperture measurement techniques.
CO2: To classify various Optical sensors for measurement of parameters like temperature, flow etc.
CO3: To design and implement fiber optic communication system for desired BER, link & power budget and time budget.
CO4: To classify optoelectronics materials & their characteristics required for photonics integrated circuits.
CO5: Identify the behavior and functionality of different optoelectronic devices.

Fiber Optics & Photonics EI47257												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	--	--	--	--	--	--	--	--	1
CO2	3	2	1	--	--	--	--	--	--	--	--	2
CO3	2	2	3	--	--	--	--	--	--	--	--	3
CO4	2	1	3	--	--	--	--	--	--	--	--	1
CO5	3	1	2									**1**
Average PO	**2.6**	**1.8**	**2.2**									**1.6**

Course content Fiber Optics:

UNIT-1.Optical fiber: Transmission characteristics, attenuation, modes, dispersion effects in optical fibres-material , waveguide dispersions, wavelengths for communication, Attenuation measurement, Cut back method, Numerical Aperture measurement, multiple wavelength measurement, Fabrication of Optical fiber,

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

UNIT-3. Optical Communication: Optical Transmitter and Receiver, Basic optical data and voice communication, Intensity modulation/Direct detection, BER, Link design power budget, rise time budget, WDM and DWDM systems, Optical Networking, Optical modulators for WDM 40 G bit/s optical network, Free Space communication systems.. 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: Modelling, Design & development and its applications.

UNIT5. Semiconductor lasers, Light Emitting Diodes, strained quantum well-laser, Distributed feedback laser, Distributed Bragg Reflector laser, and vertical cavity Surface Emitting Laser, Semiconductor Optical Amplifiers, EDFA, Junction photodiode, PIN, APD, responsivity, quantum efficiency etc.

Assessment:

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

Text Books:

1. Senior M., Optical Fiber Communications, Pearson Education.
2. Gerd Keiser, Optical Fiber Communications, 3rd edition
3. Bhattacharya P. "Semiconductor Optoelectronic Devices, Pearson Education

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: IT47201 (Program Elective-I)
SUBJECT NOMENCLATURE: DATA STRUCTURES

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

Pre-Requisite: Basic computer

Course Objective: Understand data structure stack queues, lists, trees, complexity etc. in detail. Study memory hierarchy, management techniques partitioning, segmentation, paging and comparison of techniques.

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.

CO-PO articulation Matrix

Data structures (PEC-I) IT47201												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	1
CO2	3	3	1	2	2	-	-	-	-	-	-	1
CO3	3	3	2	2	-	-	-	-	-	-	-	1
CO4	3	2	2	-	-	-	-	-	-	-	-	1
CO5	3	2	2	-	-	-	-	-	-	-	-	1
Average PO	**3**	**2.4**	**1.6**	**2**	**2**							**1**

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. Weight age 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 IV Year (4 YDC)
SUBJECT CODE: EI-47322 (PROGRAM ELECTIVE-II)
SUBJECT NOMENCLATURE: VLSI TECHNOLOGY

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	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 list different layering & oxidation methods in terms of chip fabrication.
CO3: To illustrate various patterning and doping methods.
CO4: To design Floor-planning using EDA tools along with layout design rules check and stick diagrams.
CO5: To discuss various subsystem design and memories.

CO-PO articulation Matrix

VLSI Technology (PEC-II) EI47322												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		1								
CO2	3	2					1					1
CO3	3	2					1					1
CO4	3	2	3	1			1					2
CO5	3	3	2	2			1					2
Average PO	3		2.5	1.33			1					1.5

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. Memory; NVRWM, Flash memories,6-Transistor RAMs Dynamic RAM, Read Write Cycle, Brief review of subsystem design using memory and processors and their fabrication aspects, Latch up in CMOS Circuits.

Assessment:

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

Text Books:

1 S. K. Gandhi, VLSI Fabrication principles, Wiley.

2 S. M. Sze, VLSI Technology, II edition, McGraw Hill.

3 P. Van Zant, Microchip Fabrication, A Practical Guide to Semiconductor Processing, Third Edition, McGraw Hill.

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

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

Pre-requisite: Basics of Sensors & transducers, operating systems

Course Objectives: The student will able to realise the mechanism of robotics and working with expert system & artificial intelligence.

Course Outcomes:- The student will able to:
CO1: Realization of concepts of robotics, robot mechanism and its functional analysis.
CO2: Designing of smart systems and its study in terms of interfacing and intelligent instrumentation.
CO3: Establishment of real time systems and its scheduling.
CO4: Evaluation of expert system for real time control applications.
CO5: Brief overview of artificial intelligence and its requirement in instrumentation.

CO-PO Articulation Matrix

Intelligent Instrumentation (PEC-II) EI47301												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3											1
CO3	3	1										1
CO4	3	3	1									1
CO5	3	3	1	1								2
Average PO	3	2.25	1	1								1.2

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 growing method. 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.
4. Intelligent Instrumentation: Barney.

Reference Books:

5. Patterson, Artificial Intelligence & Expert system, Pearson Education
6. Luger, Artificial Intelligence, Pearson Education

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI47499 (AB-Group)
SUBJECT NOMENCLATURE: MAJOR PROJECT PHASE-I

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	6	-	-	3	-	-	-	40	60	100

Pre-requisite: knowledge of working on different measuring devices & components, some software simulations.

Course Objective: The student will able to recognise the problem statements and also carry out the solution for the same.

Course Outcomes:
CO1: Demonstrate a sound technical knowledge of their selected project topic.
CO2: Undertake problem identification, formulation and solution.
CO3: Plan a engineering solutions to complex problems utilizing a systems approach.
CO4: Communicate with engineers and the community at large in written an oral forms.

CO-PO Articulation Matrix

Major Project Phase-I (EI47499)												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	2							
CO2		3	2	2	2	2	1	1	3	3	3	3
CO3		2	2	1	1	1	1				3	3
CO4	2	2							1	3	3	3
Average PO	**2.5**	**2**	**2**	**1.67**	**1.67**	**1.5**	**1**	**1**	**2**	**3**	**3**	**3**

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: BM-47613/ BM47001 (Program Elective-III)
SUBJECT NOMENCLATURE: MEDICAL INSTRUMENTATION

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

Pre-requisite: Knowledge of Basic aspects of Op-Amp and measuring devices.

Course Objectives: Student will able to demonstrate knowledge about detection of bio signals and their analysis.

Course Outcomes:- The student will:
CO1: To be able to identify the concepts of Bio signal generation and transduction.
CO2: To be able to discuss the basic concepts of Recording & analysis of physiological signals
CO3: To be able to identify, compare and differentiate between various therapeutic instruments.
CO4: To be able to distinguish between medical imagining modalities
CO5: To be able to report different analytical techniques.

CO-PO Articulation Matrix

Medical Instrumentation (PEC-III) BM47613/47001												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1		1	2	3	3		1			1
CO2	2	2	1		3	3	3		2	1		1
CO3		2	3	1	3	3	3		2		1	2
CO4			3	1	3	3	3		2	2	2	2
CO5	1	2	2		2	3	3		2			1
Average PO	1.33	1.75	2.25	1								1.4

Course Content: 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.

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:

4. Willard merit & dean, "Instrumental methods of analysis"

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

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

Pre-Requisite: Knowledge of Signals and Systems, Digital signal Processing

Course Objectives: The student will able to demonstrate and realize signals/filters & their significance in real worlds.

Course Outcomes: - The student will able to:
CO1: Define the visual perceptions, image sensing and image sampling.
CO2: To apply image transform for 2D image and analyze using DFT, Haar, Hadamard.
CO3: To classify image enhancement techniques and image sharpening filters in image processing.
CO4: To explain different types of image reconstruction process.
CO5: To identify and apply image compression algorithms.

CO-PO Articulation Matrix

Digital Image Processing (PEC-III) EI47611												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	2	3		1								
CO3	2	3	1	1								
CO4	3	3	2	1								1
CO5	3	3	3	1								2
Average PO	2.6	3	2	1								1.5

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-47612 (Program Elective-III)
SUBJECT NOMENCLATURE: COMPUTER NETWORKS

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

Pre-requisite: Basics of computers & operating networks/topologies

Course Objectives: The student will able to signify the different architectures and topologies in the network system.

Course Outcomes:-

CO 1: Analyze the concepts of networks, types and architectures.
CO2: Identify error free transmission of data and analyze data collision with various protocols.
CO 3: Apply various routing algorithms over a network to provide optimal path.
CO 4: Illustrate the real time applications of networks.
CO 5: Examine the addressing entities of a network with implementation of TCP, UDP protocols.

CO-PO Articulation Matrix

Computer Networks (PEC-III) EI47612												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	1										
CO3	3	2	1									1
CO4	3	2	1									1
CO5	3	1										
Average PO	3	1.6	1									1

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.

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.

Reference Book:

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

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

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

Pre-Requisite: Sensor & Transducers

Course Objective: The student will able to realize significance of sensors used in industries for automation

Course Outcomes:- At end of course, the students should have

CO1: Define automation, classify its types and application in instrumentation.
CO2: To identify components of data loggers, explain its operation and characteristics, needs for 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.

CO-PO Articulation Matrix

Automation in Instrumentation (PEC-IV) EI47776												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	--	--	--	--	--	--	--	--	1
CO2	2	3	2	1	--	--	--	--	--	--	--	2
CO3	2	3	1	1	--	--	--	--	--	--	--	1
CO4	2	3	1	3	--	--	--	--	--	--	--	1
CO5	1	3	3	2	--	--	--	--	--	--	--	3
Average PO	2	2.8	1.6									1.6

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 Education Clyde F. C

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI-47701 (Program Elective-IV)
SUBJECT NOMENCLATURE: DATA ACQUISITION SYSTEMS

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

Pre-Requisite: Basics of Analog & Digital communication & signal Processing

Course Objectives: The student will able to signify the design and implementation of acquisition sytem in the industrial aspects.

Course Outcomes:-
CO1: Identify the building blocks of Data Acquisition System.
CO2: Design the signal conditioning circuits Data Acquisition Systems.
CO3: Analyze the DAQ system for Power Management & Timing.
CO4: Analyze DAQ system using DFT, FFT and DTFT algorithms.
CO5: Design the Data Acquisition Systems for static and dynamic accuracy.

CO-PO Articulation Matrix

Data Acquistion System (PEC-IV) EI47701												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	3	2		1								
CO4	3	2	1	2								
CO5	3	2	1	2								
Average PO	3	2	1	1.67								

Course Content: 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 for Single-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).

Books & References Recommended:

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

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI-47881
SUBJECT NOMENCLATURE: INDUSTRIAL TRAINING/INTERNSHIP/SEMINAR

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

Course Objective: After completion of the course student will be able to explain and realize the real world working scenario with different aspects of project handlings or hands-on.

Course Outcomes:

CO1**:** Explore career alternatives prior to graduation.
CO2: Develop work habits and attitudes necessary for job success.
CO3: Identify, write down, and carry out performance objectives
CO4: Develop communication, interpersonal and other critical skills in the job interview process.
CO5: Develop Argumentative Skills and Critical Thinking.

CO-PO Articulation Matrix

Industrial Training/Internship/Seminar EI47881												
CO's	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	1									
CO2	1	1	1		3	2		3		1	2	1
CO3		2	3	3	1	2	3	2	1	2	3	2
CO4	2	1	1	3	2	3			3	2	3	2
CO5	3	2	2	1	2	2	1	2	2	3	3	3
Average PO	**1.75**	**1.8**	**1.6**	**2.33**	**2**	**2.25**	**2**	**2.33**	**2**	**2**	**2.75**	**2**

ELECTRONICS & INSTRUMENTATION DEPARTMENT
BE IV Year (4 YDC)
SUBJECT CODE: EI-47999 (AB Group)
SUBJECT NOMENCLATURE: MAJOR PROJECT PHASE-II

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	10	-		5	-	CW	END SEM	SW	END SEM	
								40	60	100

Course Objective: The student will able to recognize the problem statements in different domains and carry out the functional solutions to them.

Course Outcomes: after the end of course, student will able to:
CO1: Implement the technical knowledge of their selected project topic.
CO2: Undertake problem identification, formulation and solution.
CO3: Design engineering solutions to complex problems utilizing a systems approach.
CO4: Conduct an engineering project.
CO5: Communicate with engineers and the community at large in written an oral forms
CO6: Demonstrate the knowledge, skills and attitudes of a professional engineer.

CO-PO Articulation Matrix

Major Project Phase-II (EI47999)												
CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	2							
CO2		3	2	2	2	2	1	1	3	3	3	3
CO3		2	2	1	1	1	1				3	3
CO4	2	2							1	3	3	3
CO5		2	2	3	2	1	1	1	1	2	2	2
CO6	2					2	2	2	2	3	3	3
Average PO	2.5	2	2	2	1.75	1.333	1	1	1.67	2.67	2.75	2.75