Department of Applied Electronics and Instrumentation Engineering

Syllabus of 1st to 8th Semester

(to be effective from 2016-17 admission batch)

Autonomy Curriculum and Syllabus of B.Tech in Applied Electronics & Instrumentation Engineering Programme
Implemented from the Academic Year 2016
1st Year, 1st Semester

THEORY							
Sl No.	Paper Code	Theory	Contact Hours /Week				Credit Points
			L	T	P	Total	
1	M 101	Mathematics –I	3	1	0	4	4
2	CH 101	Chemistry	3	1	0	4	4
3	EE 101	Basic Electrical Engineering	3	1	0	4	4
4	HU 101	Communicative English	2	0	0	2	2
5	ME 101	Engineering Mechanics	3	1	0	4	4
Total of Theory						18	18
PRACTICAL							
6	HU191	Lang. Lab. and Seminar Presentation	0	0	2	2	1
7	CH 191	Chemistry Lab	0	0	3	3	2
8	EE 191	Basic Electrical Engineering Lab	0	0	3	3	2
9	ME 191	Engg Drawing & Graphics	0	0	3	3	2
C. SESSIONAL							
10	XC181	Extra Curricular Activity (NSS/ NCC)	0	0	2	2	1
Total of Practical & Sessional						13	08

1st Year 2nd First Year Second Semester

THEORY							
Sl No	Paper Code	Theory	Contact Hours /Week				Credit Points
			L	T	P	Total	
1	M 201	Mathematics –II	3	1	0	4	4
2	PH 201	Physics - I	3	1	0	4	4
3	EC 201	Basic Electronics Engineering	3	1	0	4	4
4	CS 201	Computer Fundamentals & Principle of Computer Programming	3	1	0	4	4
5	ME 201	Engineering Thermodynamics &	3	1	0	4	4

		Fluid Mechanics					
Total of Theory						20	20
PRACTICAL							
6	CS291	Computer Fundamentals & Principle of Computer Programming Lab	0	0	3	3	2
7	PH291	Physics -I Lab	0	0	3	3	2
8	EC291	Basic Electronics Engineering Lab	0	0	3	3	2
9	ME 292	Workshop Practice	0	0	3	3	2
Total of Practical						12	08
C.SESSIONAL							
10	MC281	Soft Skill Development	0	0	2	2	0

2nd Year, 3rd SEMESTER

A.THEORY:

	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	BS	M 301	Mathematics – III	3	1	0	4	4
2	BS	M(CS) 301	Numerical Methods	3	0	0	3	3
3	PC	EI 301	Analog Electronic Circuits	3	0	0	3	3
4	PC	EI 302	Digital Electronic Circuits	3	0	0	3	3
5	PC	EI 303	Circuit Theory and Networks	3	1	0	4	4
6	PC	EI 304	Electrical & Electronic Measurement & Instrumentation	3	1	0	4	4
Total Theory							21	21

B.PRACTICAL:

	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	BS	M(CS)391	Numerical Methods Lab	0	0	3	3	2
2	PC	EI 391	Analog Electronic Circuits Lab	0	0	3	3	2
3	PC	EI 392	Digital Electronic Circuits Lab	0	0	3	3	2
4	PC	EI 393	Circuits and Networks Lab	0	0	3	3	2
Sessional:								
6	MC	MC381	Technical Skill development-I	2	0	0	2	0
Total practical							14	8
Total 3rd Semester							35	29

2nd Year: 4th SEMESTER

A: THEORY:

	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	BS	PH 401	Physics – II	3	0	0	3	3
2	PC	EI 401	Sensors and Transducers	3	0	0	3	3
3	PC	EI 402	Microprocessors and Microcontrollers	3	0	0	3	3
4	PC	EI403	Electromagnetic Theory and Transmission Line	3	0	0	3	3
5	PC	EI 404	Signals & Systems	3	0	0	3	3
Total Theory							15	15

B.PRACTICAL & SESSIONAL:

	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	BS	PH 491	Physics –II Lab	0	0	3	3	2
2	PC	EI 491	Sensors and Transducers Lab	0	0	3	3	2
3	PC	EI 492	Microprocessor and Microcontrollers Lab	0	0	3	3	2
4	PC	EI493	Electrical & Electronic Measurement & Instrumentation Lab	0	0	3	3	2
Sessional :								
4	HU	HU 481	Technical report writing & language practice laboratory	0	0	2	2	1
Total practical							14	9
Total 4th semester							29	24

3rd Year, 5th SEMESTER

A.THEORY:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	HS	HU501	Environmental Science	2	0	0	2	2
2	PC	EI 501	Industrial Instrumentation	3	0	0	3	3
3	PC	EI 502	Analog & Digital Communication Theory	3	0	0	3	3
4	PC	EI 503	Control Engineering	3	0	0	3	3
5	PE	EI504A / EI504B/ EI 504C	Digital Signal Processing/ RF & Microwave Engineering/ Antenna Theory & Propagation	3	0	0	3	3
Total Theory							14	14

B.**PRACTICAL& SESSIONAL:**

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	PC	EI 591	Industrial Instrumentation Lab	0	0	3	3	2
2	PC	EI 592	Analog & Digital Communication	0	0	3	3	2

3	PC	EI 593	Control Engineering Lab	0	0	3	3	2

4	PE	EI594A / EI 594B / EI 594C	Digital Signal Processing Lab / RF & Microwave Engineering Lab/ Antenna & Propagation Lab	0	0	3	3	2
Sessional :								
5	**MC**	MC581	Technical Skill development-II	2	0	0	2	0
Total practical							14	8
Total 5th Semester							28	22

3rd Year: 6th SEMESTER

A: THEORY:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	PC	EI 601	Process Control-I	3	0	0	3	3
2	PC	EI 602	Bio Medical Instrumentation	3	0	0	3	3
3	PE	EI 603A / EI 603B/ EI 603C	Power Electronics / Industrial Drives/ Advanced Sensors	3	0	0	3	3
4	PE	EI604A / EI 604B	Optoelectronics & Fibre Optic Sensors/ Soft Computing	3	0	0	3	3
5	OE	CS(EI)615A / CS(EI)615B/ CS(EI)615C	Data Structures & Algorithms / Database Management System / Software Engineering	3	0	0	3	3
Total Theory							15	15

B.PRACTICAL:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	PC	EI 691	Process Control Lab	0	0	3	3	2
2	PE	EI 693A / EI 693B/ EI 693C	Power Electronics Lab / Industrial Drives Lab/ Advanced Sensors Lab	0	0	3	3	2
3	OE	CS(EI)685A / CS(EI)685B/ CS(EI)685C	Data Structures & Algorithms Lab /Database Management System Lab / Software Engineering Lab	0	0	3	3	2
Sessional :								
4	PW	EI 681	GD & Seminar	0	0	3	3	3
5	PW	EI 682	Mini Project	0	0	3	3	3
Total practical							15	12
Total 6th semester							30	27

4th Year: 7th **SEMESTER**

A.THEORY:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	HS	HU702	Values & Ethics in Profession	2	0	0	2	2
2	PC	EI 701	Telemetry and Remote Control	3	0	0	3	3
3	PC	EI 702	Process Control-II	3	0	0	3	3
4	PE	EI703A/ EI703B/ EI703C	Digital Image Processing/ Non-Conventional Energy Sources/ Analytical Instrumentation	3	0	0	3	3
5	OE	CS(EI)714A / CS(EI)714B / CS(EI)714C	Computer Networking/ Computer graphics and Multimedia / Object Oriented Programming	3	0	0	3	3
Total Theory							14	14

B. PRACTICAL & SESSIONAL:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	PC	EI 791	Telemetry and Remote Control Lab	0	0	3	3	2
2	OE	CS(EI)784A / CS(EI)784B / CS(EI)784C	Computer Networking Lab/ Computer graphics and Multimedia Lab / Object Oriented Programming Lab	0	0	3	3	2
3		EI 793	Project-1	0	0	6	6	2
Sessional								
4		EI 781	Industrial Training Evaluation	4 wks during 6th -7th Sem-break				2
5	MC	MC781	Foreign Language	2	0	0	2	0
Total practical and sessional							14	8
Total 7th Semester							28	22

4th Year: 8th **SEMESTER**

THEORY:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	HS	HU805	Industrial &Financial Management	2	0	0	2	2
2	PE	EI801A/ EI801B/ EI801C	Plant Automation/ Embedded System Design/ Virtual Instrumentation	3	0	0	3	3
3	PE	EC(EI) 802A/ EC(EI)802B/ EC(EI)802C	Mobile Communication/ VLSI & Microelectronics/ Mechatronics	3	0	0	3	3
Total Theory							8	8

B. PRACTICAL & SESSIONAL:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	PC	EI 891	Instrumentation & Control Lab	0	0	3	3	2
2	PW	EI 892	Project-2	0	0	12	12	6
3	PW	EI893	General Viva-voce					4
Total sessional							15	12
Total 8th semester							23	20

Total Credit of the course: 198

Total Credit

Sl. No.	Year	Semester	Total Credit	
			Theory	Lab
1	1st	1st	18	8
2	1st	2nd	20	8
			38	16
			Total (1st Year)= 54	
3	2nd	3rd	21	8
4	2nd	4th	14	9
5	3rd	5th	15	8
6	3rd	6th	15	12
7	4th	7th	14	8
8	4th	8th	8	12
			87	57
			Total (2nd -4th Year)= 144	
Total (1st -4th Year)			**125**	**73**
Grand Total (AICTE Norm)			**198**	

1st Year-4th Year Credit Calculation

Field	**HS**	**BS**	**ES**	**PC**	**PE**	**OE**	**Projects/ Seminar etc.**
Credit	**11**	**34**	**30**	**71**	**22**	**10**	**20**
% of Credit Coverage	**5.55**	**17.17**	**15.15**	**35.85**	**11.11**	**5.05**	**10.10**
AICTE Norms	**5-10%**	**15-20%**	**15-20%**	**30-40%**	**10-15%**	**5-10%**	**10 to 15%**

HS	Humanities and Social Sciences	PC	Professional -Core
BS	Basic Sciences	PE	Professional -Electives
ES	Engineering Sciences	OE	Open Electives

_____

Signature of the Head of the Department
Applied Electronics and Instrumentation Engineering

Department of Applied Electronics and Instrumentation Engineering

Syllabus of 1st to 8th Semester

(to be effective from 2016-17 admission batch)

Autonomy Curriculum and Syllabus of B.Tech Programme Implemented from the Academic Year 2016 Department of Applied Electronics & Instrumentation Engineering

First Year First Semester
Group A: ECE, EE, BME, AEIE/EIE
Group B: CSE, IT, FT, ME, CE

Curriculum:

THEORY							
l No	Paper Code	Theory	Contact Hours /Week				Credit Points
			L	T	P	Total	
1	M 101	Mathematics -I	3	1	0	4	4
2	CH 101	Chemistry	3	1	0	4	4
3	EE 101	Basic Electrical Engineering	3	1	0	4	4
4	HU 101	Communicative English	2	0	0	2	2
5	ME 101	Engineering Mechanics	3	1	0	4	4
Total no. of Theory						18	18
PRACTICAL							
6	HU191	Language Lab and Seminar Presentation	0	0	2	2	1
7	CH 191	Chemistry Lab	0	0	3	3	2
8	EE 191	Basic Electrical Engineering Lab	0	0	3	3	2
9	ME 191	Engineering Drawing & Graphics	0	0	3	3	2
C. SESSIONAL							
10	XC181	Extra Curricular Activity (NSS/ NCC)	0	0	2	2	1
Total no. of Practical & Sessional						13	08

Syllabus:

Paper Name: Mathematics –I
Paper Code: M101
Total Contact Hours: 40
Credit: 4

Prerequisite: Any introductory course on matrix algebra, calculus, geometry.

Course Objective: The purpose of this course is to provide fundamental concepts matrix algebra, Calculus of Single and Several Variables and Vector Analysis.

Course outcome:

On successful completion of the learning sessions of the course, the learner will be able to:

M 101.1: Recall the distinctive characteristics of Matrix Algebra, Calculus of Single and Several Variables and Vector Analysis.
M 101.2: Understand the theoretical concept of Matrix Algebra, Calculus of Single and Several Variables and Vector Analysis.
M 101.3: Apply the principles of Matrix Algebra, Calculus of Single and Several Variables and Vector Analysis to solve various problems.
M 101.4: Analyse the application of matrix algebra, differential calculus, integral calculus and vector analysis.
M 101.5: Evaluate the result for application to the problems on matrix algebra, differential calculus, integral calculus and vector analysis.

Course contents:

MODULE I [10L]

Matrix Algebra: Elementary row and column operations on a matrix, Rank of matrix, Normal form, Inverse of a matrix using elementary operations, Consistency and solutions of systems of linear equations using elementary operations, Linear dependence and independence of vectors, Concept & Properties of different matrices (unitary, orthogonal, symmetric, skew-symmetric, hermitian, skew-hermitian), Eigen values and Eigen vectors of a square matrix (of order 2 or 3), Characteristic polynomials, Caley-Hamilton theorem and its applications, Reduction to diagonal form (upto 3^{rd} order).

MODULE II [10L]

Calculus-I (Functions of single variable): Rolle's theorem, Mean value theorem- Lagrange & Cauchy, Taylor's and Maclaurin's theorems, Expansion of simple functions by Taylor's and Maclaurin's Theorems, Fundamental theorem of integral calculus, Evaluation of plane areas, volume and surface area of a solid of revolution and lengths, Convergence of Improper integrals, Beta and Gamma Integrals - Elementary properties and the Inter relations.

MODULE III [12L]

Calculus-II (Functions of several variables): Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives, Total Differentiation, Derivatives of composite and implicit functions, Euler's theorem on homogeneous functions, Chain rule, Maxima and

minima of functions of two variables – Lagrange‘s method of Multipliers, Change of variables-Jacobians (up to three variables), Double and triple integrals.

MODULE IV [8L]

Vector Calculus: Scalar and vector triple products, Scalar and Vector fields, Vector Differentiation, Level surfaces, Directional derivative, Gradient of scalar field, Divergence and Curl of a vector field and their physical significance, Line, surface and volume integrals, Green‘s theorem in plane, Gauss Divergence theorem, Stokes‘ theorem, Applications related to Engineering problems.

Text Books:

1.E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley, 1999.
2.B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.
3.R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, 2008.
4.H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley, 1995.
5.G. Strang, Linear algebra and its applications (4th Edition), Thomson, 2006.

Reference Books:

1.S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India, 2000.
2.M. Apostol, Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.
3.TG. B. Thomas and R. L. Finney, Calculus and Analytic Geometry (9th Edition), ISE Reprint, Addison-Wesley, 1998.
4.Hughes-Hallett et al., Calculus - Single and Multivariable (3rd Edition), John-Wiley and Sons, 2003.
5.J. Stewart, Calculus (5th Edition), Thomson, 2003.
6.J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier,2006.
7..Rade and B.Westergen, Mathematics Handbook: for Science and Engineering (5th edition, 1st Indian Edition), Springer, 2009.
8.Murray R Spiegel and Seymour Lipschutz, Schaum's Outline of Vector Analysis.
9.Richard Bronson , Schaum's Outline of Matrix Operations.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	**PO**												**PSO**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
M 101.1	3	2	1	-	-	-	-	-	-	-	-	-	-	
M 101.2	3	3	2	1	-	-	-	-	-	-	-	2	1	-
M 101.3	3	2	3	2	-	-	-	-	-	-	-	2	2	3
M 101.4	2	3	2	2	-	-	-	-	-	-	-	1	3	3
M 101.5	3	2	2	1	-	-	-	-	-	-	-	1	-	2

Paper Name: Chemistry
Paper Code: CH 101
Total Contact Hours: 40
Credit: 4

Pre requisites: 10+2 science with chemistry

Course Objective
Understanding of the fundamental theories and applications of thermodynamics, electrochemical principles in modern electrochemical cells and to get an insight into electronic structure of crystals and nanomaterials. Learning about the Synthesis, properties and applications of polymers , fuels and alternative energy sources & their significance in petrochemical industries. Analyzing water quality for its various parameters & its significance in industries.

Course Outcome

CH101.1: Able to remember fundamental concepts of Engineering Chemistry and define relevant terminologies.
CH101.2: Able to understand the principles of thermodynamics, kinetics and physical properties of molecules.
CH101.3: Able to apply the basic concept of Organic Chemistry and knowledge of chemical reactions to industries and technical fields.
CH101.4: Able to analyze and explain the defects in crystalline solids and protective measures of corrosion of metals in the industries.
CH101.5: Able to apply the knowledge of different fuels and corrosion to different industries
CH101.6: Able to assess qualitative and quantitative parameters of applied and industrial chemistry.

Course contents

Module 1 [8L]

Chemical Thermodynamics –I
1.1 Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.
Introduction to first law of thermodynamics: Different statements, mathematical form.
Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.
2L
1.2 Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas.
Heat Capacity: Definition, Classification of Heat Capacity (Cp and CV): Definition and General expression of Cp - CV. Expression of Cp - CV for ideal gas.
Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas, Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process.
Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation. **3L**
1.3 2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature (brief).
Evaluation of entropy: characteristics and expression, physical significance. Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal

gas, standard free energy and chemical potential, Condition of spontaneity and equilibrium reaction. **3L**

Module 2 [7L]

2.1 Reaction Dynamics

Reaction laws: rate and order; molecularity; zero and first order kinetics, second order kinetics (same reactant concentration), Pseudounimolecular reaction, Arrhenius equation. **3L**

Mechanism and theories of reaction rates (Content beyond the syllabus)

2.2 Solid state Chemistry

Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency).

Role of silicon and germanium in the field of semiconductor, n-type, p-type semiconductor, photo voltaic cell, fabrication of integrated circuits. **4L**

Module 3 [8L]

Electrochemistry

3.1 Conductance

Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). **1L**

3.2 Electrochemical cell

Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, calomel half cell (representation, cell reaction, expression of potential, Discussion, Application). **3L**

3.3 Concept of battery

Battery and Commercial electrochemical cell: Dry cell, acid storage cell, alkaline storage cell, fuel cell (construction, representation, cell reaction, expression of potential, discussion, application). **2L**

3.4 Corrosion and its control

Introduction, cause and effect of corrosion, types of corrosion: dry, wet and other: Electrochemical corrosion, galvanic corrosion, passivation and protective measure. **2L**

Module 4 [12L]

4.1 Structure and reactivity of Organic molecule

Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals. Brief study of some addition, eliminations and substitution reactions. **3L**

4.2 Polymers

Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg.: Theory and mathematical expression only), Poly dispersity index (PDI).

Polymerization processes: addition and condensation polymerization (mechanism not required), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of Tm) and amorphicity (Concept of Tg) of polymer.

Preparation, structure and use of some common polymers: plastic (HDPE, LDPE, PVC, PP, PMMA, Polyester, PTFE, Bakelite), rubber (natural rubber, SBR), fibre (nylon 6, nylon 6,6), Vulcanization of rubber, Conducting polymers and bio-polymers. **7L**

4.3 Nano material

Basic principles of nano science and technology, classification, preparation, properties and application of nano material. **2L**

Module 5 [5L]

5.1 Industrial Chemistry

Fuels

Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Proximate analysis of coal, Calorific value.

Liquid fuel: Petroleum, classification of petroleum, Refining, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Biodiesel.

Gaseous fuels: Natural gas, water gas, Coal gas, bio gas, CNG, LPG **3L**

5.2 Water

Introduction, source of water, water quality parameter, specification for drinking water (BIS and WHO standards), Chlorination of Water, Types of hardness- Units, Brief Softening methods.

2L

Short overview of water treatment plants (Content beyond the syllabus)

Reference Books

1.Engineering Chemistry: Bandyopadhyay and Hazra
2.Physical Chemistry: P.C. Rakshit
3.Organic Chemistry: Finar, vol-1
4.Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008
5.A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.
6.Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**	**PSO1**	**PSO2**
CH101. 1	3	1	-	-	-	-	-	-	-	-	-	-	**2**	**2**
CH101.2	3	2	1	-	-	-	-	-	-	-	-	-	1	2
CH101.3	-	-	2	-	2	-	-	-	-	-	-	1	-	1
CH101.4	2	-	1	-	2	-	-	-	-	-	-	-	2	1
CH101.5	2	-	-	-	-	-	2	-	-	-	-	1	1	2

Paper Name: Basic Electrical Engineering
Paper Code: EE101
Total Contact Hours: 41
Credit: 4

Pre requisite: Basic 12st standard Physics and Mathematics

Course Objective:
Basic electrical engineering is an introductory course in electrical engineering. Students are introduced to simple applied electrical circuits, theories and practice to impart skill set to have visualization of electrical engineering applications. It is a course suitable for students pursuing electrical engineering as well as other related engineering disciplines.

Course Outcomes:
At the end of this course, students will able

EE 101.1: Understand Basic Electrical circuits, Power distribution and Safety measures.
EE 101.2: Analyse an apply DC network theorems.
EE 101.3: Analyse and apply concept of AC circuits of single-phase and three-phase.
EE 101.4: Understand basic principles of Transformers and Rotating Machines.

Course Contents:

DC CIRCUITS (7L)
Definition of electric circuit, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, node, branch, active and passive elements, Kirchhoff's laws, Source equivalence and conversion, Network Theorems-Superposition Theorem, Thevenin's Theorem, Norton Theorem, Maximum Power Transfer Theorem, Star-Delta Conversions.

MAGNETIC CIRCUITS (3L)
Concept of Magnetic circuit, B-H curve, Analogous quantities in magnetic and electric circuits, Faraday's law, iron losses, self and mutual inductance, Energy stored in magnetic field.

AC SINGLE PHASE CIRCUITS (8L)
Sinusoidal quantities, Average and RMS values, peak factor, Form factor, Phase and Phase difference, concept of phasor diagram, V-I Relationship in R,L,C circuit, Combination R,L,C in AC series , parallel and series parallel circuits with phasor diagrams, impedance and admittance, Power factor, Power in AC circuit, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit.

THREE PHASE CIRCUITS (3L)
Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method.

DC MACHINES (6L)
Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Torque Equation ,Speed

Torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control).

SINGLE PHASE TRANSFORMER (5L)
Constructional parts, Types of transformers, Emf equation, No Load no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.

THREE PHASE INDUCTION MOTOR (6L)
Types, Construction, production of rotating field, principle of operation, Slip and Frequency ,rotor emf and current, Equivalent circuit and phasor diagram, Torque Slip characteristics torque-speed characteristics Starting of induction motor by star delta starter and(DOL starter). Speed Control of Three phase induction motor by variation of supply frequency, supply voltage and number of poles.

GENERAL STRUCTURE OF ELECTRICAL POWER SYSTEM (3L)
Power generation to distribution through overhead lines and underground cables with single line diagram, Earthing of Electrical Equipment, Electrical Wiring Practice

Text books

1.V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
2.Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication
3.Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH
4.C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books

1.H. Cotton, Willey Press
2.J.B. Gupta, Basic Electrical Engineering, Kataria & Sons .
3.Kothari & Nagrath, Basic Electrical Engineering, TMH

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PSO 2
EE 101.1	3	1	-	-	-	2	-	1	-	2	2	1	2	2
EE 101.2	2	3	-	3	-	-	-	-	2	-	1	2	3	3
EE 101.3	2	3	1	2	-	-	2	-	-	-	1	2	3	3
EE 101.4	1	2	3	1	-	1	2	-	2	-	-	3	1	1

Paper Name: Communicative English
Paper Code: HU101
Total Contact Hours: 26
Credits: 2

Pre requisites:

Basic knowledge of high school English.

Course Objectives:

Designed to meet the basic survival needs of communication in the globalized workplace, including knowledge of and competency in the use of macro-skills in reading and writing proficiency, functional grammar and usage.

Course Outcomes:

By doing this course the students will be enabled to do the following:
HU101. 1. Able to define, identify and describe the basics of communication theory and its application.

HU101.2.Able to recognize, recall and make use of English vocabulary and its varied usage

HU101. 3. Able to develop and apply reading and writing skills in an academic and global business context

HU101. 4. Able to identify, explain and use the grammatical structures and forms in English.

HU101. 5. Able to analyse, classify and elaborate on the forms and formats of business writing.

Course Content:

The proposed revised syllabus is as follows:

Module 1: Communication: Interface in a Globalized World [5L]

a .Definition of Communication& Scope of Communication

Process of Communication—Models and Types

Verbal—Non-Verbal Communication, Channels of Communication

Barriers to Communication & surmounting them

[to be delivered through case studies involving intercultural communication]

Module 2: Vocabulary and Reading [5L]

a. Word origin—Roots, Prefixes and Suffixes, Word Families, Homonyms and Homophones

b. Antonyms and Synonyms, One-word substitution c. Reading—Purposes and Skills

Reading Sub-Skills—Skimming, Scanning, Intensive Reading

Comprehension Practice (Fiction and Non fictional Prose/Poetry)

Texts:

(i)Isaac Asimov, *I Robot* (—Robbie OR —Little Lost Robot)

(ii)George Orwell, —Shooting an Elephant

(iii)Ruskin Bond, —The Cherry Tree OR —The Night Train at Deoli

(iv) Robert Frost, —Stopping by the Woods on a Snowy Evening.

Precis Writing

(Use of daily newspapers for reading practice is recommended)

Module 3: Functional Grammar and Usage [6L]

a. Articles, Prepositions, Verbs

Verb-Subject Agreement

Comparison of Adjectives

Tenses and their Use

Transformation of Sentences (Singular-Plural, Active-Passive, Direct-Indirect, Degrees of Comparison)

Error Correction

Module 4: Business writing [10L]

a. Business Communication in the Present-day scenario

b. Business Letters (Letters of Inquiry, Sales Letters, Complaint and Adjustment Letters, Job Application Letters)

c. Drafting of a CV and Résumé

d. Memo, Notice, Advertisement, Agenda, Minutes of Meetings

e. E-mails (format, types, jargons, conventions)

References:

1.Raymond Murphy. *English Grammar in Use*. 3rd Edn. CUP, 2001.

2.Seidl & McMordie. *English Idioms& How to Use Them*. Oxford:OUP, 1978.

3.Michael Swan. *Practical English Usage*. Oxford:OUP, 1980.

4.Simeon Potter. *Our Language*. Oxford:OUP, 1950.

5.Pickett, Laster and Staples. *Technical English: Writing, Reading & Speaking*. 8th ed. London: Longman, 2001.

6.IIT Kanpur, English Language & Communication Skills (ENG 112 C) syllabus.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
HU101.1	-	-	-	-	-		1	-	2	3	-	2	-	-
HU101.2	-	-	-	-	-		1	-	2	3	-	3	-	-
HU101.3	-	-	-	-	-	3	3	3	2	3	2	3	2	-
HU101.4	-	-	-	-	-	3	3	2	-	3	-	3	-	-
HU101.5	-	-	-	-	-	3	3	3	-	3	2	3	2	-

Paper Name: Engineering Mechanics
Paper Code: ME101
Total Contacts Hours: 45
Credit: 4

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics.

Course Objective:
Understand the vector and scalar representation of forces and moments.
Describe static equilibrium of particles and rigid bodies in two dimensions and three dimensions including the effect of Friction
Analyze the properties of surfaces & solids in relation to moment of inertia.
Illustrate the laws of motion, kinematics of motion and their interrelationship.
Study the concepts of engineering mechanics on deformable materials under applied loads.

Course Outcome:
Upon successful completion of the course, student should be able to:

Upon successful completion of the course, student should be able to:
ME 101.1. Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.
ME 101.2. Study the effect of friction in static and dynamic conditions.
ME 101.3. Understand the different surface properties, property of masses and material properties.
ME 101.4. Analyze and solve different problems of kinematics and kinetics.

Course Content:

Module1: Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector). 2L

Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications. 3L+1T

Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces

4L+1T

Module2: Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium. 3L+1T

Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction.

3L+1T

Module3: Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadralateral, composite areas consisting of above figures. 4L+1T

Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone. 3L+1T

1L+1T

Principle of virtual work with simple application.

Module4: Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.

2L+1T

Module5: Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs 3L+1T

.

Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion). 2L+1T

Module6: Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy ; Principle of conservation of energy; Power and efficiency. 3L+2T

Books Recommended

1.Engineering Mechanics [Vol-I & II]by Meriam & Kraige, 5th ed. – Wiley India

2.Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI

3.Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. – TMH

4.Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P

5.Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– Chhaya Prakashani

6.Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.

7.Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – Pearson

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
ME101.1	3	3	2	2	-	-	-	-	1	-	-	-	1	1
ME101.2	3	3	2	2	-	-	-	-	1	-	-	1	1	1
ME101.3	3	2	3	2	1	-	-	-	1	-	-	1	1	1
ME101.4	3	3	3	3	-	-	-	-	1	-	1	-	1	1

Paper Name: Lang. Lab. and Seminar Presentation
Paper Code: HU191
Total Contact Hours: 26
Credit: 1

Pre requisites: Basic knowledge of LSRW skills.

Course Objectives: To train the students in acquiring interpersonal communication skills by focussing on skill acquisition techniques and error feedback.

Course Outcome:
HU191.1: Able to understand advanced skills of Technical Communication in English through Language Laboratory.
HU191.2: Able to apply listening, speaking, reading and writing skills in societal and professional life.
HU191.3: Able to demonstrate the skills necessary to be a competent Interpersonal communicator.
HU191.4: Able to analyze communication behaviors.
HU191.5: Able to adapt to multifarious socio-economical and professional arenas with the help of effective communication and interpersonal skills.

Course Contents:

Module 1: Introduction to the Language Lab
a. The Need for a Language Laboratory
b. Tasks in the Lab
c. Writing a Laboratory Note Book
Module 2: Active Listening
a. What is Active Listening?
b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note taking c. Contextualized Examples based on Lab Recordings
Module 3: Speaking
a. Speaking (Choice of words, Speech Syntax, Pronunciation, Intonation)
b. Language Functions/Speech Acts
c. Speaking using Picture Prompts and Audio Visual inputs
d. Conversational Role Plays (including Telephonic Conversation)
e. Group Discussion: Principles and Practice
Module 4: Lab Project Work
a. Keeping a Listening Log
b. Writing a Film Review/Advertisements

References:
1.IIT Mumbai**, Preparatory Course in English** syllabus
2.IIT Mumbai, **Introduction to Linguistics** syllabus
3.Sasikumar et al. *A Course in Listening and Speaking*. New Delhi: Foundation Books, 2005.
4.Tony Lynch, *Study Listening*. Cambridge: Cambridge UP, 2004.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
HU 191.1	-	3	-	-	-	3	2	1	3	3	3	3	2	2
HU 191.2	-	3	-	2	-	3	-	-	3	3	3	3	3	3
HU 191.3	-	3	-	-	-	3	-	-	3	3	3	3	3	3
HU 191.4	-	3	2	3	-	3	2	-	3	3	3	3	3	3
HU 191.5	-	3	2	2	-	2	-	3	3	3	3	3	2	2

Paper Name: Chemistry Lab
Paper Code: CH 191
Total Contact hour: 36
Credit: 2

Pre requisites: 10+2 science with chemistry

Course Objective

Acquiring knowledge on Standard solutions and the various reactions in homogeneous and heterogeneous medium. Understanding the basic principles of pH meter and conductivity meter for different applications and analysing water for its various parameters. Synthesis of Polymeric materials and Nanomaterial.

Course Outcome

CH191.1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
CH191.2: Able to work as an individual also as a team member
CH191.3: Able to analyse different parameters of water considering environmental issues
CH191.4: Able to synthesize nano and polymer materials.
CH191.5: Capable to design innovative experiments applying the fundamentals of chemistry

Course contents

List of Experiments:

1.To Determine the alkalinity in given water sample.
2.Redox titration (estimation of iron using permanganometry)
3.To determine calcium and magnesium hardness of a given water sample separately.
4.Preparation of phenol-formaldehyde resin (Bakelite).
5.Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
6.Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
7.pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
8.Determination of dissolved oxygen present in a given water sample.
9.To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution).
Innovative experiment:
Preparation of silver nano-particles.

Note: From the list of 10 (Ten) experiments a minimum of 7 (seven) experiments shall have to be performed by one student of which Sl. No. 4 (Preparation of Bakelite) has to be mandatory.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CH191.1	3	2	1	1	1	1	-	-	2	-	-	-	**1**	**2**
CH191.2	-	-	-	-	-	-	-	-	3	-	-	-	2	1
CH191.3	-	-	-	-	-	2	3	-	-	-	-	1	-	1
CH191.4	-	-	-	-	2	1	-	-	-	-	-	-	2	1
CH191.5	2	-	2	-	1	-	-	-	-	-	-	1	1	2

Paper Name: Basic Electrical Engineering LAB
Paper Code: EE191
Total Contact Hours: 36
Credit: 2

Pre requisites:

Basic Physics and applied physics.
Basic Mathematics.
Basic concept of Electric Circuit

Course Objective:

Provide knowledge for the analysis of basic electrical circuit.

To introduce electrical appliances, machines with their respective characteristics.

Course Outcome:
After completion of the course students able to:
EE 191.1: Identify and use common electrical components.
EE 191.2: Develop electrical networks by physical connection of various components and analyze the circuit behaviour.
EE 191.3: Apply and analyze the basic characteristics of transformers and electrical machines.
EE191.4: Apply and analyse the equivalent parameters, Losses, efficiency of transformers

Course contents

LIST OF EXPERIMENTS

1.Characteristics of Fluorescent ,Tungsten and Carbon filament lamps
2.Verification of Thevenin's and Norton's Theorem
3.Verification of Superposition Theorem
4.Calibration of Ammeter and Wattmeter
5.Study of R-L-C series circuit
6.Open circuit and short circuit test of a single phase Transformer
7.Starting, Reversing of a and speed control of D.C shunt motor
8.Test on single phase Energy Meter
9.Familiarization of PMMC and MI type Meter
10.Familiarization with house wiring practice

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO10	PO 11	PO 12	PSO 1	PSO 2
EE 191.1	3	-	-	-	-	2	-	1	1	-	1	2	2
EE 191.2	2	2	1	-	-	-	1	-	3	2	3	3	3
EE 191.3	3	3	-	1	-	-	1	1	2	2	2	3	3
EE 191.4	3	3	1	1	1	-	1	1	2	2	2	3	3

Paper Name: Engineering Drawing & Graphics
Paper Code: ME 191
Total Contact Hours: 36
Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:
To learn basics of drafting and use of drafting tools.
To know about engineering scales, dimensioning and various geometric curves.
To Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
To acquire the knowledge of Computer Aided drafting using design software.

Course Outcomes:
Upon successful completion of this course, the student will be able to:
ME191.1. Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
ME 191.2. Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
ME 191.3. Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
ME 191.4. Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.

Course contents:

List of Experiments:

1.Lines, Lettering, Dimensioning, Scales (Plain scale & diagonal Scale).

2.Geometrical Construction and Curves – Construction of Polygons, Parabola, Hyperbola & ellipse

3.Projection of Points, Lines and Surfaces – orthographic projection- first angle and third angle projection, projection of lines and surfaces- Hexagon

4.Projection of Solids – (Cube, Pyramid, Prism, cylinder and Cone

5.Sectional Views – for simple sold objects

Introduction to Computer Aided Drafting – using auto cad & / or similar software- Introduction to Cartesian and polar coordinate systems, absolute and relative coordinates; Basic editing commands: line, point, trace, rectangle, polygon , circle, arc, ellipse, polyline; editing methods; basic object selection methods – window and crossing window, erase, move, copy, offset, fillet, chamfer, trim, extend, mirror; display command; zoom, pan, redraw, regenerate; simple dimensioning and text, simple exercises.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
ME 191.1	2	-	1	2	-	1	-	-	1	-	-	1	3	2
ME 191.2	3	-	2	2	-	1	-	-	1	1	-	1	3	2
ME 191.3	2	2	2	1	-	1	-	-	1	-	-	1	3	2
ME 191.4	1	-	2	2	2	1	-	-	1	1	-	1	3	2

Paper Name: Extra Curricular Activity (NSS/ NCC)
Paper Code: XC 181
Total Contact hours: 20
Credit: 1

Course Objectives:
The objectives of the course are as follows:
To increase student awareness about the weaker and unprivileged sections of society
To expose students to environmental issues and ecological concerns
To make students self aware about their participatory role in sustaining society and the environment

Course contents

List of Activities:

Creating awareness in social issues
Participating in mass education programmes
Proposal for local slum area development
Waste disposal
Environmental awareness ``
Production Oriented Programmes
Relief & Rehabilitation work during Natural calamities
Creating awareness in social issues:
1. Women's development – includes health, income-generation, rights awareness.
2. Hospital activities – Eg. writing letters for patients, guiding visitors
3. Old age home – visiting the aging in-mates, arranging for their entertainment.
4. Children's Homes - visiting the young in-mates, arranging for their entertainment
5. Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)
6. Gender issues- Developing an awareness, to link it with Women's Cell of college
Participating in mass education
programmes 1.Adult education
2. Children's education
Proposal for local slum area development
One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.
Environmental awareness
• Resource conservation – Awareness to be developed on water, energy,soil.
• Preservation of heritage monuments- Marches, poster campaigns
• Alternative energy consciousness amongst younger school-children.
• Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.
• Waste disposal- Proper methods of domestic waste disposal.
Production Oriented Programmes
5. Working with people and explaining and teaching improved agricultural practices
6. Rodent control land pest control practices;
7. Soil-testing, soil health care and soil conservation;
8. Assistance in repair of agriculture machinery;

Work for the promotion and strengthening of cooperative societies in villages;
Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
Popularization of small savings and
Assistance in procuring bank loans

Assisting the authorities in distribution of rations, medicine, clothes etc.;
Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
Assisting and working with local authorities in relief and rescue operation; Collection of clothes and other materials, and sending the same to the affected areas;

First Year Second Semester

Curriculum

THEORY							
Sl No	Paper Code	Theory	Contact Hours /Week				Credit Points
			L	T	P	Total	
1	M 201	Mathematics -II	3	1	0	4	4
2	PH 201	Physics - I	3	1	0	4	4
3	EC 201	Basic Electronics Engineering	3	1	0	4	4
4	CS 201	Computer Fundamentals & Principle of Computer Programming	3	1	0	4	4
5	ME 201	Engineering Thermodynamics & Fluid Mechanics	3	1	0	4	4
Total of Theory						20	20
PRACTICAL							
6	CS291	Computer Fundamentals & Principle of Computer Programming Lab	0	0	3	3	2
7	PH291	Physics -I Lab	0	0	3	3	2
8	EC 291	Basic Electronics Engineering Lab	0	0	3	3	2
9	ME292	Workshop Practice (Gr-A)	0	0	3	3	2
Total of Practical						12	08
C.SESSIONAL							
10	MC 281	Soft Skill Development	0	0	2	2	0

Paper Name: Mathematics-II
Paper Code: M 201
Total Contact Hours: 40
Credit: 4

Prerequisite: Any introductory course on calculus.

Course Objective: The purpose of this course is to provide fundamental concepts Ordinary Differential Equations, Graph Theory and Laplace Transform.

Course outcome:
On successful completion of the learning sessions of the course, the learner will be able to:
M 201.1: Recall the distinctive characteristics of Ordinary Differential Equations, Graph Theory and Laplace Transform.
M 201.2: Understand the theoretical workings of various algorithms related to graph theory and the theorems of differential equation and Laplace transforms.
M 201.3: Apply the principles of differential equation, graph theory and Laplace transforms to solve various problems.
M 201.4: Analyse the application of improper integral, Laplace Transform, ordinary differential equation, graph theory
M 201.5: Evaluate the result for application to the problems on improper integral, Laplace Transform, ordinary differential equation, graph theory.
M 201.6: Design graph to solve different real life problems

Course contents:

Module I **[10L]**
Ordinary differential equations (First order): First order and first degree Exact equations,Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation, General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation), Applications related to Engineering problems.
Module II [10L]
Ordinary differential equations (Higher order): General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Eulerequations, Solution of simultaneous linear differential equations, Applications related to Engineering problems.
Module III [10L]
Basic Graph Theory:Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph, Walks, Paths, Circuits, Euler Graph, Cut-sets and cut-vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph.Tree, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra's Algorithm for shortest path problem, Determination of minimal spanning tree using Kruskal's and Prim's algorithm.
** Extra lecture hours may be taken for this module

MODULE IV: [**10L**]
Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of t f (t), LT of f (t)/t , LT of derivatives of f (t), L.T. of ∫f(u) du. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT. Applications related to Engineering problems.

Beyond Syllabus:
Combinatorics: Fundamental Principles, Permutations, Combinations, Binomial Coefficients.

Text Books:

1.E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley, 1999.
2.B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.
3.R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, 2008.

Reference Text Books:

1.W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley, 2005.
2.R.K. Ghosh and K.C.Maity, An Introduction to Differential Equations, New Central Book Agency.
3.V. K. Balakrishnan, Graph Theory, Schaum's Outline, TMH.
4.J. Clark and D. A. Holton, A first course at Graph Theory,Allied Publishers LTD.
5.D. B. West, Introduction to Graph Theory,Prentice-Hall of India.
6.N. Deo, Graph Theory, Prentice-Hall of India.
7.J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier, 2006.
8.L. Rade and B. Westergen, Mathematics Handbook: for Science and Engineering (5th edition, 1st Indian Edition), Springer, 2009.
9.Murray R.Spiegel, Laplace Transform, Schaum's Outline Series, McGRAW-HILL.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
M 201.1	3	2	1	-	-	-	-	-	-	-	-	-	-	-
M201.2	3	3	2	1	-	-	-	-	-	-	-	2	2	-
M 201.3	3	2	3	2	-	-	-	-	-	-	-	2	2	3
M 201.4	2	3	2	2	-	-	-	-	-	-	-	1	3	3
M 201.5	3	2	2	1	-	-	-	-	-	-	-	1	-	2
M 201.6	3	2	3	2	-	-	-	-	-	-	-	2	3	2

Paper Name: Physics -I
Paper Code: PH 201
Total Contact Hours: 41
Credit: 4

Pre requisites: Knowledge of Physics upto 12^{th} standard.

Course Objective:

The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

Course Outcome:

At the end of the course students' should have the
PH 201.1**:** Describe various types mechanical resonance and its electrical equivalence
PH 201.2**:** Explain basic principles of Laser, Optical fibres and various types of semiconductors
PH 201.3**:** Apply superposition to explain interference and diffraction as well as apply wave mechanics for attainment of Heisenberg's uncertainty principle
PH 201.4**:** Analyze importance of light as a carrier of information and examine different crystallographic structures according to their co-ordination number and packing factors
PH 201.5**:** Justify the need of quantum mechanics as remedy to overcome limitations imposed by classical physics

Course contents

Module 1 (8L):-
Oscillations
1.1 Simple harmonic motion: Concepts with examples, Superposition of SHMs in two mutually perpendicular directions: Lissajous' figures, Engineering Applications and related Numerical problems 2L

1.2 Damped vibration: Differential equation and its solution, Logarithmic decrement, quality factor, Engineering Applications and related Numerical problems. 3L

1.3 Forced vibration: Differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance, relevant applications including LCR circuits, Numerical problems 3L

Module 2 (10L):-
Classical Optics:
2.1 Interference of light: Wave nature of light (Huygen's principle), Conditions of sustained interference double slit as an example; qualitative idea of spatial and temporal coherence, conservation of energy and intensity distribution; Newton's ring (qualitative descriptions of working principles and procedures-no deduction required). Engineering applications, Numerical Problems. 3L

Fresnel's biprism (beyond the syllabus). 1L(ext)

2.2 Diffraction of light: Fresnel and Fraunhofer class, Fraunhofer diffraction for plane transmission grating (elementary treatment of intensity distribution for N-slits), single slit and double slits as examples, missing order, Rayleigh criterion, resolving power of grating and microscope (Definition and formula; no deduction required). Engineering Applications, Numerical Problems. 4L

2.3 Polarization: Definition, plane of polarization, p**l**ane of vibration, Malus law, fundamental concepts of plane, circular and elliptical polarizations (only qualitative idea) with examples, Brewster's law, Double refraction: ordinary and extraordinary rays, Nicol's prism, Engineering applications, Numerical problems. 3L

Module 3 (9L):-
Quantum Physics:

3.1 Quantum Theory: Inadequacy of classical physics; Planck's quantum hypothesis-Qualitative (without deductions), particle concept of electromagnetic wave (example: photoelectric and Compton effect; qualitative discussions only), wave particle duality; phase velocity and group velocity; de Broglie wave; Davisson and Germer experiment. 4L

3.2 Quantum Mechanics 1: Concept of wave function, Physical significance of wave function, Probability interpretation; wave function normalization condition and its simple numerical applications; uncertainty principle-applications, Schrödinger equation (no mathematical derivation). 4L

Module 4 (6L):
X-ray & Crystallography

4.1 X-**rays** – Origin of Characteristic and Continuous X-ray, Bragg's law (No derivation), Determination of lattice constant, Applications, Numerical problems. 2L

4.2 Elementary ideas of crystal structure - lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, fcc and bcc, **hcp** lattices, (use of models in the class during teaching is desirable) Miller indices and miller planes, Co-ordination number and Atomic packing factor, Applications, Numerical problems. 4L

Module 5 (8L):
Modern Optics-I:
5.1 Laser: Concepts of various emission and absorption process, working principle of laser, metastable state, Population Inversion, condition necessary for active laser action, optical resonator, ruby laser, He-Ne laser, **semiconductor laser**, Einstein A and B coefficients and equations, industrial and medical applications of laser. 5L

5.2 Fibre optics and Applications: Principle and propagation of light in optical fibres- Numerical aperture and Acceptance angle, V number, Types of optical fibres (material, refractive index, mode), Losses in optical fibre-attenuation, dispersion, bending, Numerical problems. 3L

Recommended Text Books for Physics I (PH101//201):

Oscillations:
1.Classical Mechanics- J. C. Upadhyay (Himalya Publishers)
2.Classical Mechanics-Shrivastav
3.Classical Mechanics-Takwal & Puranik (TMH)
4.Sound-N. K. Bajaj (TMH)

5.Advanced Acoustics-D. P. Roy Chowdhury (Chayan Publisher)
6.Principles of Acoustics-B.Ghosh (Sridhar Publisher)
7.A text book of sound-M. Ghosh (S. Chand publishers)
8.Electricity Magnetism-Chattopadhyay & Rakshit (New Central Book Agency)
9.A text book of Light- K.G. Mazumder & B.Ghoshs, (Book & Allied Publisher)
10.R.P. Singh (Physics of Oscillations and Waves)
11.A.B. Gupta (College Physics Vol. II)
12.Chattopadhya and Rakshit (Vibration, Waves and Acoustics)

Classical Optics & Modern Optics-I:
1.A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)
2.A text book of Light-Brijlal & Subhramanium, (S. Chand publishers)
3.Modern Optics-A. B. Gupta (Book & Allied Publisher)
4.Optics-Ajay Ghatak (TMH)
5.Optics-Hecht
6.Optics-R. Kar, Books Applied Publishers
7.Möler (Physical Optics)
8.E. Hecht (Optics)
9.E. Hecht (Schaum Series)
10.F.A. Jenkins and H.E White
11.C.R. Dasgupta (Degree Physics Vol 3)

Quantum Physics
1.Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
2.Quantum Mechanics-Bagde Singh (S. Chand Publishers)
3.Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)
4.Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)
5.Quantum Mechanics-Bransden (Pearson Education Ltd.)
6.Perspective of Modern Physics-A. Beiser (TMH)
7.Eisberg & Resnick is published by Wiley India
8.A.K. Ghatak and S Lokenathan
9.E.E. Anderson (Modern Physics)
10.Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India
11.Binayak Dutta Roy [Elements of Quantum Mechanics]

X-ray & Crystallography
1.Solid state physics-Puri & Babbar (S. Chand publishers)
2.Materials Science & Engineering-Kakani Kakani
3.Solid state physics- S. O. Pillai
4.Introduction to solid state physics-Kittel (TMH)
5.Solid State Physics and Electronics-A. B. Gupta, Nurul Islam (Book & Allied Publisher)
6.S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)

General Reference:
1.Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2.Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
3.Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)
4.Engineering Physics Vol: 1-Sudipto Roy, Tanushri Ghosh, Dibyendu Biswas (S. Chand).
5.Engineering Physics Vol:1-S. P. Kuila (New Central)

6.University Physics-Sears & Zemansky (AddisonWesley)
7.B. Dutta Roy (Basic Physics)
8.R.K. Kar (Engineering Physics)
9.Mani and Meheta (Modern Physics)
10.Arthur Baiser (Perspective & Concept of Modern Physics)

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PH 201.1	**3**	-	-	-	-	-	-	-	-	-	-	2	1	3
PH 201.2	**3**	-	-	-	-	-	-	-	-	-	-	2	3	3
PH 201.3	**3**	2	-	-	-	-	-	-	-	-	-	1	2	1
PH 201.4	2	**3**	-	-	-	-	-	-	-	-	-	1	3	2
PH 201.5	1	**3**	-	-	-	-	-	-	-	-	-	**1**	**2**	**2**

Paper Name: Basic Electronics Engineering
Paper code: EC201
Total Contact Hours: 40
Credits: 4

Prerequisites
A basic course in Electronics and Communication Engineering Progresses from the fundamentals of electricity, direct current (DC) devices and circuits , series and parallel circuits to the study of active and passive components, Ohm's Law, Kirchoff's Law i.e. KVL,KCL, Ampere's Law etc.

Course objectives:

Students will be able to Analyze the behaviour of semiconductor diodes in Forward and Reverse bias . To design a half wave and full wave rectifiers, Explore V-I characteristics of Bipolar Junction Transistor n CB, CE & CC configurations. To acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amps. Students will be able to explain feedback concept and different oscillators. They will also be familiar with the analysis of digital logic basics and measuring Electronic devices. Students will have knowledge about characteristics of FET.

Course Outcomes:

EC 201.1: Understand the PN junction diode, ideal diode, diode models and its circuit analysis, Remember the application of diodes and special diodes.
EC 201.2: Analyse how operational amplifiers are modelled and analysed, and to design Op-Amp circuits to perform operations such as integration differentiation on electronic signals.
EC 201.3: Assess both positive and negative feedback in electronic circuits.
EC 201.4: Develop the capability to analyse and design simple circuits containing non-liner elements such as transistors using the concepts of load lines, operating points and incremental analysis.

Course contents

Module-I: Basics of semiconductor 6L Conductors, Insulators, and Semiconductors- crystal structure, Fermi Dirac function, Fermi level, E-k and Energy band diagrams, valence band, conduction band, and band gap; intrinsic, and extrinsic (p-type and n-type) semiconductors, position of Fermi level in intrinsic and extrinsic semiconductor, drift and diffusion current – expression only (no derivation) , mass action law , charge neutrality in semiconductor, Einstein relationship in semiconductor , Numerical problems on- Fermi level, conductivity, mass action law, drift and diffusion current .

Module-II: P-N Junction Diode and its applications 8L

p-n junction formation and depletion region, energy band diagram of p-n junction at equilibrium and barrier energy, built in potential at p-n junction, energy band diagram and current through p-n junction at forward and reverse bias, V-I characteristics and current expression of diode , temperature dependencies of V-I characteristics of diode , p-n junction breakdown – conditions , avalanche and Zener breakdown , Concept of Junction capacitance, Zener diode and characteristics.

Diode half wave and full wave rectifiers circuits and operation (I_{DC}, I_{rms} , V_{Dc}, V_{rms}) , ripple factor without filter, efficiency ,PIV,TUF; Reduction of ac ripples using filter circuit (Qualitative analysis); Design of diode clipper and clamper circuit - explanation with example, application of Zener diode in regulator circuit. Numerical problems.

Module-III : Bipolar junction transistor(BJT) 6L

Formation of PNP/NPN Transistors ,energy band diagram, current conduction mechanism , CE ,CB,CC configurations , transistor static characteristics in CE ,CB and CC mode, junction biasing condition for active, saturation and cut-off modes ,current gain α ,β and γ, early effect.

Biasing and bias stability; biasing circuits - fixed bias; voltage divider bias; collector to base bias , D.C. load line and Quiescent point, calculation of stability factors for different biasing circuits.

BJT as an amplifier and as a switch – Graphical analysis; Numerical Problems.

Module-IV: Field effect transistor (FET) 4L

Concept of field effect, channel width modulation Classification of FETs-JFET, MOSFET, operating principle of JFET. drain and transfer characteristics of JFET (n-channel and p-channel), CS,CG,CD configurations, Relation between JFET parameters. FET as an amplifier and as a switch– graphical analysis. E-MOSFET (n-channel and p-channel), D-MOSFET (n-channel and p-channel), Numerical Problems .

Module-V: Feedback and Operational Amplifier 10L

Concept of feedback with block diagram, positive and negative feedback, gain with feedback. Feedback topologies, effect of feedback on input and output impedance, distortion, concept of oscillation and Barkhausen criterion.

Operational amplifier – electrical equivalent circuit ,ideal characteristics , Non ideal characteristics of op-amp – offset voltages ;bias current ;offset current; Slew rate ; CMRR and bandwidth, Configuration of inverting and non-inverting amplifier using Op-amp, closed loop voltage gain of inverting and non-inverting amplifier , Concept of virtual ground, Applications op-amp – summing amplifier; differential amplifier; voltage follower ; basic differentiator and integrator .

Problems on Characteristics of Op-amp, CMRR, slew rate, amplifier and application of Op-amp to be discussed. Any other relevant problems related to topic may be discussed or assigned.

Module-VI: Cathode Ray Oscilloscope (CRO) 2L

Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

Module-VII: Digital Electronics 4L

Binary numbers and conversion, Basic Boolean algebra, Logic gates (AND,OR,NOR,NOT,NAND,XOR) and realization of functions.

Text Books:

1.D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
2.Millman & Halkias, Integrated Electronics, Tata McGraw Hill.
3.Boyelstad & Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.
4.Sedra & Smith, Microelectronics Engineering

Reference Books:

1.John D. Ryder, Electronic Fundamentals and Applications, PHI
2.J.B.Gupta, Basic Electronics, S.K. Kataria.
3.Malvino: Electronic Principle.
4.Schilling & Belove: Electronics Circuits.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EC 201.1	3	3	2	1	-	2	2	1	1	2	2	1	1	1
EC 201.2	3	2	2	2	1	-	-	1	1	2	1	1	2	1
EC 201.3	3	3	3	1	1	1	1	-	-	1	2	1	2	1
EC 201.4	3	3	2	1	1	2	2	1	2	-	1	-	1	1

Computer Fundamentals & Principle of Computer Programming
Code: CS 201
Total No. of Lectures: 40
Credits: 4

Prerequisites:
Number system
Boolean Algebra

Course Objective(s)
To develop the programming skills of students
To know the principles of designing structured programs
To write basic C programs using
Selection statements
Repetitive statements
Functions
Pointers
Arrays
Strings

Course Outcome:

CS201.1 Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.
CS201.2 Write, Compile and Debug programs in C language and use different data types for writing the programs.
CS201.3 Design programs connecting decision structures, loops and functions.
CS201.4 Explain the difference between call by value and call by address.
CS201.5 Understand the dynamic behavior of memory by the use of pointers.

Use different data structures and create / manipulate basic data files and developing applications for real world problems.

Course content

Fundamentals of Computer: (10 L)

History of Computer, Generation of Computer, Classification of Computers 1L

Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices 2L

Binary and Allied number systems representation of signed & unsigned numbers, BCD, ASCII, Binary number Arithmetic – Addition and Subtraction (using 1's complement and 2's complement)
2L
Logic gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR - only truth tables, logic gate symbols and logic equations for gates only
1L
Assembly language, high level language, machine level language, compiler and assembler (basic concepts) 1L

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX

1L

Problem solving-Algorithm & flow chart

2L

C Fundamentals: (30 L)

Variable and Data Types:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements 3L

C Operators & Expressions:
Arithmetic operators, relational operators, logical operators, increment and decrement operators, bitwise operators, assignment operators, conditional operators, special operators - type conversion, C expressions, precedence and associativity.
Input and Output: Standard input and output, formatted output - printf, formatted input scanf, bit fields 5L

Branching and Loop Statements:
Statement and blocks, if - else, switch, goto and labels, Loops - while, for, do while, break and continue 3L

Fundamentals and Program Structures:
auto, external, static and register variables
Functions, function types, function prototypes, functions returning values, functions not returning values, scope rules, recursion, C preprocessor and macro

6L

Arrays, Strings and Pointers:
One dimensional arrays, Two-dimensional arrays, Multidimensional arrays. Passing an array to a function
Character array and string, array of strings, Passing a string to a function, String related functions
Pointers, Pointer and Array, Pointer and String, Pointer and functions, Dynamic memory allocation

6L

Files handling with C:
formatted and unformatted files, Command line arguments, fopen, fclose, fgetc, fputc, fprintf, fscanf function 4L

Structures and Unions:
Basic of structures, arrays of structures, structures and pointers, structures and functions

3L

Text book:
1.Kerninghan B.W. & Ritchie D.M. - The C Programming Language

2.Gottfried - Programming with C Schaum

3.Kanetkar Y. - Let us C

4.Balaguruswamy - Programming in C

Recommended reference Books:

1.Pohl and Kelly - A Book on C

2.Kerninghan, B.W. - The Elements of Programming Style

3.Schied F.S. Theory and Problems of Computers and Programming

4.Rajaraman V. Fundamental of Computers

5.M.M.Oka Computer Fundamentals,EPH

6.Leon Introduction to Computers,Vikas

7.Leon- Fundamental of Information Technology,Vikas

8.Ram B. Computer Fundamentals, New Age International

9.Ravichandran D. Programming in C, New Age International

10.Xavier C. Introduction to Computers, New Age International

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS201.1	3	3	-	-	-	-	-	-	-	-	-	-	1	1
CS201.2		2	-	-	-	-	-	-	-	-	-	-	1	1
CS201.3	3	3	-	-	-	-	-	-	-	-	-	-	1	1
CS201.4	-	-	-	-	-	-	-	-	-	-	-	-	1	1
CS201.5	3	-	3	3	3	-	-	-	-	-	-	-	1	1

Paper Name: Engineering Thermodynamics & Fluid Mechanics
Paper Code: ME 201
Total Contact Hours: 48
Credits: 4

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics.

Course Objective:
To understand the basic principles of thermodynamics, heat and work transfer.
To acquire the knowledge of basic concepts of Heat Engine, Entropy from Second law of thermodynamics.
To get the knowledge of thermodynamic properties of a pure substance and inter-relationships between key properties of a system or state possessed by the substance.
To understand the basic principles of fluid mechanics, and ability to analyze fluid flow problems with the application of the momentum and energy equations.

Course Outcome:
Upon successful completion of this course, the student will be able to:

ME 201.1 Know about thermodynamic equilibrium, heat & work transfer, First law and its application.
ME 201.2 Understand the basic concepts of Heat Engine, Entropy from Second law of thermodynamics.
ME 201.3 Know the thermodynamic characteristics of a pure substance and its application in power cycles (Simple Rankine cycles, Air Standard cycles)
ME 201.4 Knowledge of basic principles of fluid mechanics, and ability to analyze fluid flow problems with the application of the momentum and energy equations

Course content

Module 1: 8L+3T

Basic Concepts of Thermodynamics
Introduction: Microscopic and Macroscopic viewpoints
Definition of Thermodynamic systems: closed, open and isolated systems Concept of Thermodynamics state; state postulate.
Definition of properties: intensive, extensive & specific properties. Thermodynamic equilibrium
Thermodynamic processes; quasi-static, reversible & irreversible processes; Thermodynamic cycles.
Zeroth law of thermodynamics. Concept of empirical temperature.

Heat and Work
Definition & units of thermodynamic work.
Examples of different forms of thermodynamic works; example of electricity flow as work. Work done during expansion of a compressible simple system
Definition of Heat; unit of Heat
Similarities & Dissimilarities between Heat & Work

Ideal Equation of State, processes; Real Gas
Definition of Ideal Gas; Ideal Gas Equations of State.
Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes.
Equations of State of Real Gases: Van der Waal's equation; Virial equation of state.

Properties of Pure Substances
p-v, T-s & h-s diagrams of pure substance like H_2O
Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status.
Definition of dryness fraction of steam, degree of superheat of steam.

Module 2: 4L+3T

1st Law of Thermodynamics
Definition of Stored Energy & Internal Energy 1st Law of Thermodynamics for cyclic processes Non Flow Energy Equation.
Flow Energy & Definition of Enthalpy.
Conditions for Steady State Steady flow: Steady State Steady Flow Energy Equation.

Module 3: 6L+3T

2nd Law of Thermodynamics
Definition of Sink, Source Reservoir of Heat.
Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators
Kelvin – Planck & Clausius statements of 2nd Law of Thermodynamics Absolute or Thermodynamic scale of temperature, Clausius Integral Entropy
Entropy change calculation for ideal gas processes. Carnot Cycle & Carnot efficiency
PMM-2; definition & its impossibility

Module 4: 6L+3T

Air standard Cycles for IC engines
Otto cycle; plot on P-V, T-S planes; Thermal efficiency Diesel cycle; plot on P-V, T-S planes; Thermal efficiency

Rankine cycle of steam
Chart of steam (Mollier's Chart)
Simple Rankine cycle plot on P -V, T-S, h-s planes Rankine cycle efficiency with & without pump work
(Problems are to solved for each module)

Module 5: 9L+3T

Properties & Classification of Fluids
Ideal & Real fluids
Newton's law of viscosity; Newtonian and Non-Newtonian fluids
Compressible and Incompressible fluids

Fluid Statics
Pressure at a point
Measurement of Fluid Pressure Manometers:
simple & differential U-tube
Inclined tube

Fluid Kinematics
Stream line
Laminar & turbulent flow
external & internal flow

Continuity equation

Dynamics of ideal fluids

Bernoulli's equation
Total head; Velocity head; Pressure head
Application of Bernoulli's equation

Measurement of Flow rate: Basic principles

Venturimeter, Pilot tube, Orificemeter
(Problems are to be solved for each module)

Engineering Thermodynamics

Text:
Engineering Thermodynamics - P K Nag, 4th edn, TMH.
References:

1."Fundamentals of Thermodynamics" 6e by Sonntag & Van Wylin published by Wiley India.

2.Engineering Thermodynamics – Russel & Adeliyi (Indian edition), OUP

3.Engineering Thermodynamics – Onkar Singhh, New Age International Publishers Ltd.

4.Basic Engineering Thermodynamics – R Joel, 5th Ed., Pearson

Fluid Mechanics

Text:
Fluid Mechanics and Hydraulic Machines - R Bansal

References:

1.Introduction to Fluid Mechanics and Fluid Machines - S.K.Som and G.Biswas. 2nd edn, TMH

2.Fluid Mechanics by A.K.Jain.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
ME201.1	3	3	2	2	-	1	1	1	1	-	1	2	2	2
ME201.2	3	3	2	2	-	1	2	-	1	-	1	2	2	2
ME201.3	2	2	1	1	-	2	1	-	-	-	-	1	2	2
ME201.4	3	3	2	2	-	1	1	-	-	-	1	1	2	2

Paper Name: Computer Fundamentals & Principle of Computer Programming Lab
Paper Code: CS291
Total Contact Hours: 36
Credit: 2

Prerequisites:
Basic Computer Knowledge

Course Objective(s):
To develop an understanding of the design, implementation, and compilation of a C program
To gain the knowledge about pointers, a fundamental for understanding data structure issues
To understand the usage of user defined data type for application development

Course Outcome:

CS291.1. Understanding the working of different operating systems like DOS, Windows, Linux.

CS291.2. Write, Compile and Debug programs in C language.

CS291.3. Design programs connecting decision structures, loops.

CS291.4. Exercise user defined functions to solve real time problems.

CS291.5. Inscribe C programs using Pointers to access arrays, strings, functions, structures and files.

Experiment should include but not limited to the following:

1.Some basic commands of DOS, Windows and Linux Operating System, File handling and Directory structures, file permissions, creating and editing simple C program, compilation and execution of C program.

2.Writing C Programs on variable, expression, operator and type-casting.

3.Writing C Programs using different structures of if-else statement and switch-case statement.

4.Writing C Programs demonstrating use of loop (for loop, while loop and do-while loop) concept and use of break and continue statement.

5.Writing C Programs demonstrating concept of Single & Multidimensional arrays.

6.Writing C Programs demonstrating concept of Function and Recursion.

7.Writing C Programs demonstrating concept of Pointers, address of operator, declaring pointers and operations on pointers.

8.Writing C Programs demonstrating concept of structures, union and pointer to structure.

9.Writing C Programs demonstrating concept of String and command line arguments.

10.Writing C Programs demonstrating concept of dynamic memory allocation.

11.Writing C Programs demonstrating concept of File Programming.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS291.1	3	3	-	-	-	-	-	-	-	-	-	-	2	2
CS291.2	-	2	-	-	-	-	-	-	-	-	-	-	2	2
CS291.3	3	3	-	-	-	-	-	-	-	-	-	-	2	2
CS291.4	-	-	-	-	-	-	-	-	-	-	-	-	2	2
CS291.5	3	-	3	3	3	-	-	-	-	-	-	-	2	2

Paper Name: Physics I Lab
Paper Code: PH 291
Credit: 2

Pre requisites: Knowledge of Physics upto 12^{th} standard.

Course Outcome :
At the end of the course students' should have the

PH291.1 **:** Demonstrate experiments allied to their theoretical concepts

PH291.2 **:** Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spctrometer

PH291.3**:** Participate as an individual, and as a member or leader in groups in laboratory sessions actively

PH291.4 **:** Analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments

General idea about Measurements and Errors (One Mandatory):
Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
Proportional error calculation using Carrey Foster Bridge.

Any 7 to be performed from the following experiments

Experiments on Oscillations & Elasticity:
1.Study of Torsional oscillation of Torsional pendulum & determination of time period using various load of the oscillator.
2.Experiments on Lissajous figure (using CRO).
3.Experiments on LCR circuit.
4.Determination of elastic modulii of different materials (Young's modulus and Rigidity modulus)

Experiments on Optics:
1.Determination of wavelength of light by Newton's ring method.
2.Determination of wavelength of light by Laser diffraction method.
3.Determination of numerical aperture and the energy losses related to optical fiber experiment
4.Measurement of specific rotation of an optically active solution by polarimeter.

Experiments on Quantum Physics:
1.Determination of Planck's constant using photoelectric cell.
2.Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.

In addition it is **recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:

1.Determination of wavelength of light by Fresnel's bi-prism method (beyond the syllabus).
2.Study of half-wave, quarter-wave plate (beyond the syllabus)
3.Study of dispersive power of material of a prism.
4.Study of viscosity using Poyseullie's caplillary flow method/using Stoke's law.

5.Measurement of nodal and antinodal points along transmission wire and measurement of wave length.
Any other experiment related to the theory**.**

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
PH 291.1	**2**	-	-	-	-	-	-	-	-	-	-	-	1	1
PH 291.2	**1**	-	-	-	-	-	-	-	-	-	-	-	1	-
PH 291.3	-	-	-	**2**	-	-	-	-	-	-	-	-	1	-
PH 291.4	-	-	-	-	-	-	-	-	**3**	-	-	-	1	1

Paper Name: Basic Electronics Engineering Lab
Paper Code: EC291
Total Contact Hours: 36
Credit: 2

Prerequisites
A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm's law, Ampere's law

Course objectives:
Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias, They will also be able to design rectifiers like half-wave, full-wave rectifiers etc. using diodes. The ability of circuit design with Bipolar Junction Transistor in CB, CE & CC configurations will be improved. The students will acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amp. Basic concepts and Circuit design with logic gates will be developed in the students. The students will be able design circuit using FET .

Course Outcomes:

EC291.1: Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.

EC291.2: Analyze the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.

EC291.3: Determination of input-offset voltage, input bias current and Slew rate, Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.

EC291.4: Able to know the application of Diode, BJT &OPAMP.

Course contents:

List of Experiments:

1.Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, millimeters etc.
2.Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3.Study of I-V characteristics of Junction diodes.
4.Study of I-V characteristics of Zener diodes.
5.Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6.Study of I-V characteristics of BJTs.
7.Study of I-V characteristics of Field Effect Transistors.
8.Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.

9.Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
10.Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
11.Study of Logic Gates and realization of Boolean functions using Logic Gates.
12.Study of Characteristic curves for CB, CE and CC mode transistors.
Innovative Experiment

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EC 291.1	3	3	2	1	-	2	2	1	1	2	2	1	1	1
EC 291.2	3	2	2	2	1	-	-	1	1	2	1	1	2	1
EC 291.3	3	3	3	1	1	1	1	-	-	1	2	1	2	1
EC 291.4	3	3	2	1	1	2	2	1	2	2	1	1	1	-

Paper Name: Workshop Practice
Paper Code: ME 292
Total Contact Hours: 36
Credit: 2
Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:
To understand the basic knowledge of Workshop Practice and Safety.
To identify and use of different hand tools and other instruments like Hand Saw, Jack Plane, Chisels etc and operations like such as Marking, Cutting etc used in manufacturing processes.
To get hands on practice in various machining metal joining processes such as Welding, Brazing, Soldering, etc.

Course Outcome:
Upon successful completion of this course, the student will be able to:

ME292.1 Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
ME292.2 Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and performing operations like such as Marking, Cutting etc used in manufacturing processes.
ME292.3 Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
ME292. 4 Get hands on practice of in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

Course contents

List of Activities:

Sl. No.	Syllabus	Contact Hrs
Module 1	Pattern Making	6
Module 2	Sheet Metal Work	6
Module 3	Fitting	9
Module 4	Machining in Lathe	9
Module 5	Welding	6

MODULE 1 – PATTERN MAKING.

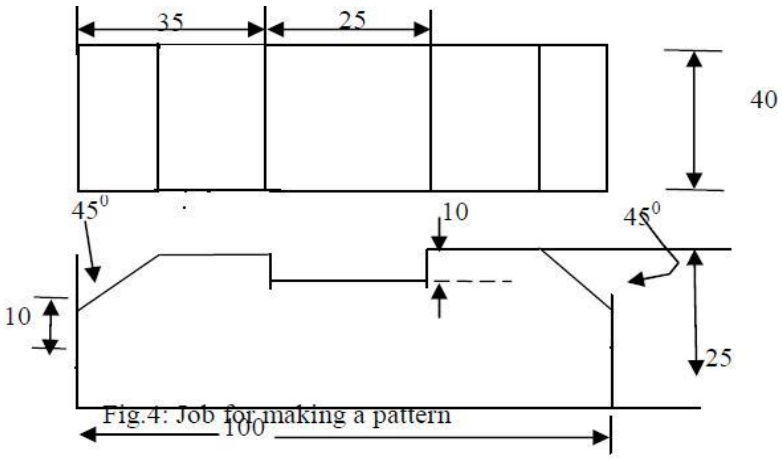
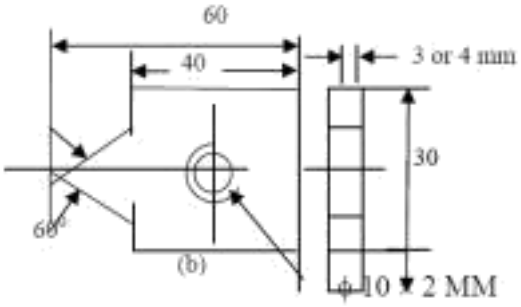
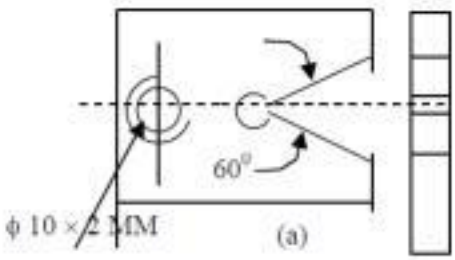


Fig.4: Job for making a pattern



MODULE 3- FITTING SHOP.



OR

MODULE 4 – MACHINING IN LATHE & SHAPING M/C

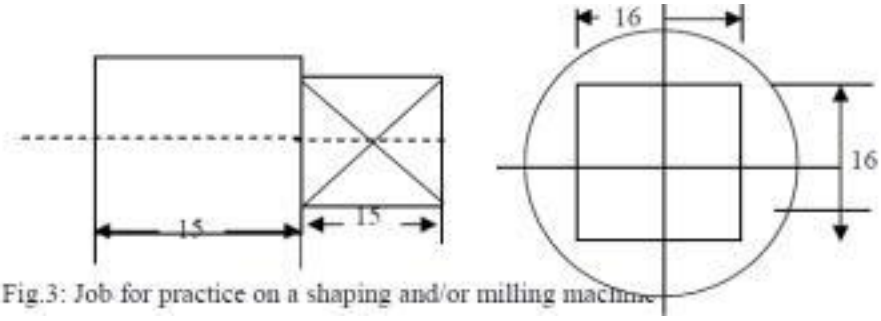
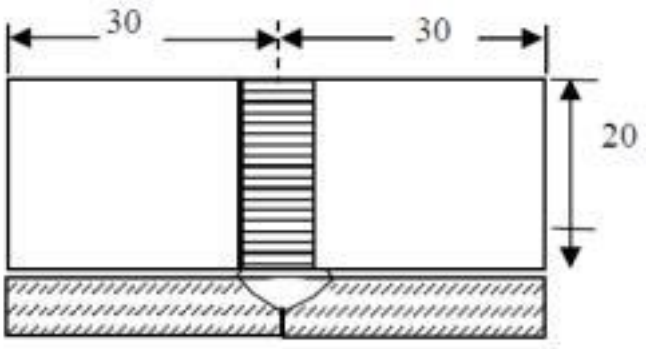


Fig.3: Job for practice on a shaping and/or milling machine

MODULE 5 – WELDING



CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	**PO**												**PSO**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
ME292.1	3	-	-	-	-	2	-	1	-	-	1	-	3	3
ME292.2	3	-	-	-	-	1	-	2	-	-	-	-	3	1
ME292.3	2	-	-	-	-	1	-	1	-	-	-	-	3	2
ME292.4	3	-	-	-	1	3	-	3	-	-	-	1	3	3

Paper Name: Soft Skills Development
Paper Code: MC-281
Credit: 2

Course Objectives:

The objectives of this course are as follows:
To expose the students to different aspects of corporate life and workplace behavior
To introduce workplace behavioral norms, etiquettes and standards
To equip students to face interviews, presentations and other professional interactions

MODULE	CONTENT
One	Communication Training
Two	Communication Training (Accent Neutralization)
Three	Business Etiquette
Four	CV / Resume Writing
Five	Corporate Life and Protocols
Six	Group Discussion
Seven	Leadership Skill
Eight	Team Work
Nine	Public Speaking and Interview Basics
Ten	Business Telephone Etiquette
Eleven	Reading skill

Rearrange

MODULE ONE – COMMUNICATION TRAINING (2L)

Organisational Communication and Structure.
Vocabulary related to Corporate Operation.
Modes of Communication (Telephone, Conference Call, Team Huddle, Public Relation etc.
Communication with Clients, Customers, Suppliers etc.
Verbal and Non-Verbal Communication, Proxemics and Para Language.
Vocabulary Building (Synonym / Antonym / One word Substitution etc.)

MODULE TWO- COMMUNICATION TRAINING (ACCENT NEUTRALISATION) (2L)

Mother Tongue Influence
Vowel Sounds and Consonantal Sounds
Pronunciation and Neutral Accent.
Intonation.
Rate of Speech, Pausing, Pitch Variation and Tone.

MODULE THREE – BUSINESS ETIQUETTE (2L)

Presenting oneself in the Business Environment.
Corporate Dressing and Mannerism.
Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
Multi Cultural Etiquette.
Cultural Difference.
E-mail Etiquette.

MODULE FOUR – JOB APPLICATION AND CV / VIDEO RESUME (2L)

Format (Chronological, Skill Oriented, Functional etc.)
Style and Appearance.
Writing Tips and Video Content Presentation tips.
Types of Cover Letter or Job Application Letter.

MODULE FIVE - INTRODUCTION TO CORPORATE LIFE AND PROTOCOLS (2L)

Introduction of Companies (Domain Specific)
Opportunities and Growth Plan.
Performance and Corporate Behaviour.
Service Level Agreement and Corporate Jargon.
Networking and Adapting to Culture, Technology and Environment.

MODULE SIX – GROUP DISCUSSION (2L)

Introduction, Definition and Purpose.
Types of Group Discussion.

Strategies and Protocols of Group Discussion.
Skills and Parameters of Evaluation.
Practice Session and Video Viewing Task.

MODULE SEVEN – LEADERSHIP SKILL (2L)

Leadership Theories.
Traits and Skills of the Leader.
Roles, Duties and Responsibilities.
Case Study of Leaders.
Interpersonal relationship with Team.

MODULE EIGHT – TEAM WORK (2L)

Concept of Team Culture.
Stages of Team Development (Forming, Storming, Norming, Performing, Adjourning)
Team Working Agreement (Participation, Decision Making, Problem Solving.
Conflict Management, Flexibility, Negotiation Skill.
Team Building (Assess, Plan, Execute and Evaluate)

MODULE NINE – PUBLIC SPEAKING AND INTERVIEW BASICS (2L)
Extempore.
JAM.
Interview Skill
Interview over Telephone, Video Conference Interview etc.

MODULE TEN – BUSINESS TELEPHONE ETIQUETTE (2L)
Five Phases of a Business Call.
Pitch, inflection, Courtesy and Tone.
Understanding, Rate of Speech, Enunciation.
Hold Procedure.
Cold and Hot Transfer protocols.
Dealing with Different Types of Customers (Irate, Talkative, Turnaround etc.)

MODULE ELEVEN- READING SKILL

Vocabulary from context, speed reading, skimming, inferring, comprehension test etc.

ASSESSMENT		
1.	**Viva**	**10**
2.	**Personal Skill Enhancement Log**	**25**
3.	**Movie Making: Video Resume**	**25**
4.	**Term End Project**	**40**

LIST OF REFERENCE:

1. Effective Communication and Soft-Skills: Strategies for Success, Nitin Bhatnagar and Mamta Bhatnagar, Pearson, 2012.

2. Soft Skills: Know yourself and know the World, Dr. K.Alex, S Chand, 2009.

3. Soft Skills at Work: Technology for Career Success, Beverly Amer, Course Technology, 2009.

4. The Pronunciation of English, Daniel Jones, Cambridge University Press, 1998.

5. Global Business Etiquette: A Guide to International Communication and Customs, Jeanette S. Martin and Lillian H. Chaney, Praeger, 2012.

6. The CV Book: Your Definitive Guide to Writing the Perfect CV, James Innes, Pearson.

7. Understanding American Business Jargon: A Dictionary, W. Davis Folsom, Greenwood Press, 2005.

8. Navigating Corporate Life, Stanley Tyo.

9. Group Discussion: A Practical Guide to Participation and Leadership, Kathryn Sue Young, Julia T. Wood, Gerald M. Phillips and Douglas J. Pedersen, Waveland Press Inc., 2007.

10. The Leadership Skills Handbook, Jo Owen, KoganPage, 2006.

11.Teamwork Training, Sharon Boller, ASTD Press, 2005.

12. Public Speaking for Success, Dale Carnegie, Penguin, 2005.

13. Effective Interviewing Skills, Tracey A. Swift and Ivan T. Robertson, BPS Books, 2000.

14. Telephone Etiquette: Making Lasting First Impressions, Theo Gilbert-Jamison, Performance Solutions, 2013.

15. Reading Comprehension Strategies: Theories, Interventions and Technologies, Danielle S. McNamara, Lawrence Earlbaum Associates, 2007.

16. www.mindtools.com.

2nd Year,3rd Sem

A.THEORY:

	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	BS	M 301	Mathematics – III	3	1	0	4	4
2	BS	M(CS) 301	Numerical Methods	3	0	0	3	3
3	PC	EI 301	Analog Electronic Circuits	3	0	0	3	3
4	PC	EI 302	Digital Electronic Circuits	3	0	0	3	3
5	PC	EI 303	Circuit Theory and Networks	3	1	0	4	4
6	PC	EI 304	Electrical & Electronic Measurement & Instrumentation	3	1	0	4	4
Total Theory							21	21

B.PRACTICAL:

	Field	Code	Subjects	Contact hours/week				Credit Points
				L	T	P	Total	
1	BS	M(CS)391 391	Numerical Methods Lab	0	0	3	3	2
2	PC	EI 391	Analog Electronic Circuits Lab	0	0	3	3	2
3	PC	EI 392	Digital Electronic Circuits Lab	0	0	3	3	2
4	PC	EI 393	Circuits and Networks Lab	0	0	3	3	2
Sessional:								
5	MC	MC381						0
Total practical							14	8
Total 3rd Semester							35	29

Paper Name: Mathematics-III
Paper Code: M 301
Contact: L-T-P: 3L-0T-0P
Total Lectures: 44L
Credits: 4

Prerequisite: Any introductory course on Calculus and Combinatorics.

Course Objective: The purpose of this course is to provide fundamental concepts of Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equation, Partial Differential Equations.

Course outcome:

On successful completion of the learning sessions of the course, the learner will be able to:

M 301.1: Recall the underlying principle and properties of Fourier series, Fourier transform, probability distribution of a random variable, calculus of complex variable, partial differential equation and ordinary differential equation.

M 301.2: Exemplify the variables, functions, probability distribution and differential equations and find their distinctive measures using the underlying concept of Fourier series, Fourier transform, probability distribution of a random variable, calculus of complex variable, partial differential equation and ordinary differential equation.

M 301.3: Apply Cauchy's integral theorem and the residue theorem to find the value of complex integration, and compute the probability of real world uncertain phenomena by indentifying probability distribution that fits the phenomena.

M 301.4: Solve partial differential equation using method of separation of variables and ordinary differential equation using techniques of series solution and special function (Legendre's and Bessel's)

M 301.5: Find the Fourier series and Fourier transform of functions by organizing understandings of underlying principles and also evaluate the integral using Parseval's identity.

MODULE I:

Fourier Series and Fourier Transform:

Sub-Topics: Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Special wave forms: Square wave, Half wave Rectifier, Full wave Rectifier, Saw-toothed wave, Triangular wave. Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π, Fourier Series for functions of period , Dirichlet's conditions, Sum of Fourier series. Examples. Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Parseval's identity (statement only).Examples.

Fourier Transform:

Sub-Topics: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation . (statement only), Fourier Transform of Derivatives.Examples.Convolution Theorem Examples Inverse of Fourier Transform,Examples. .

Discussions on application of the topic related to EIE

10L

MODULE II:

Probability Distributions: Definition of random variable.Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof).Examples. Definitions of Expectation & Variance, properties & examples. Some important discrete distributions: Binomial, Poisson. Continuous distributions: Normal. Determination of Mean, Variance and standard deviation of the distributions. Correlation &Regression analysis, Least Square method, Curve fitting.

Discussions on application of the topic related to EIE

10L

MODULE III:

Calculus of Complex Variable

Introduction to Functions of a Complex Variable, Concept of Limit, Continuity and Differentiability. Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. Construction of Analytic functions: Milne Thomson method, related problems.

Complex Integration.

Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve. Examples.Cauchy's theorem (statement only).Cauchy-Goursat theorem (statement only).Examples.Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function.Examples.Taylor's series, Laurent's series. Examples.

Zeros and Singularities of an Analytic Function & Residue Theorem.

Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m. Examples on determination of singularities and their nature. Residue, Cauchy's Residue theorem (statement only), problems on finding

the residue of a given function, Introduction Conformal transformation, Bilinear transformation, simple problems.

Discussions on application of the topic related to EIE

12L

MODULE IV:

Basic concepts of Partial **differential equation (PDE)**:

Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transforms methods.

Topic: Solution of Initial Value & Boundary Value PDE's by Separation of variables, Laplace & Fourier transform methods.

PDE I: One dimensional Wave equation.

PDE II: One dimensional Heat equation.

PDE III: Two dimensional Laplace equations.

Introduction to series solution of Ordinary differential equation (ODE): Validity of the series solution of an ordinary differential equation. General method to solve Po y"+P1 y'+P2 y=0 and related problems to Power series method**.** Brief review on series solution of Bessel & Legendre differential equation. Concepts of generating functions.

Discussions on application of the topic related to EIE **12L**

Text Books:

1.Rathor, Choudhari,:Descrete Structure And Graph Theory.

2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics - Sultan Chand & Sons.

3. Lipschutz S: Theory and Problems of Probability (Schaum's Outline Series) - McGraw Hill Book. Co.

4.Spiegel M R: Theory and Problems of Probability and Statistics (Schaum's Outline Series) - McGraw Hill Book Co.

5.Goon A.M., Gupta M K and Dasgupta B: Fundamental of Statistics - The World Press Pvt. Ltd.

6.Spiegel M R: Theory and Problems of Complex Variables (Schaum's Outline Series) - McGraw Hill Book Co.

7.Bronson R: Differential Equations (Schaum's Outline Series) - McGraw Hill Book Co.

8.Ross S L: Differential Equations - John Willey & Sons.

9.Sneddon I. N.: Elements of Partial Differential Equations - McGraw Hill Book Co.

10. West D.B.: Introduction to Graph Theory - Prentice Hall

11. Deo N: Graph Theory with Applications to Engineering and Computer Science - Prentice Hall.

12. Grewal B S: Higher Engineering Mathematics (thirtyfifthedn) - Khanna Pub.

13. Kreyzig E: Advanced Engineering Mathematics - John Wiley and Sons.

14.Jana- Undergradute Mathematics

15. Lakshminarayan- Engineering Math 1.2.3

16. Gupta- Mathematical Physics (Vikas)

17. Singh- Modern Algebra

18. Rao B: Differential Equations with Applications & Programs, Universities Press

19.Murray: Introductory Courses in Differential Equations, Universities Press

20. Prasad: Partial Differential Equations, New Age International

21. Chowdhury: Elements of Complex Analysis, New Age International

22. Bhat: Modern Probability Theory, New Age International

23. Dutta: A Textbook of Engineering Mathematics Vol.1 & 2, New Age International

24. Sarveswarao: Engineering Mathematics, Universities Press

25. Dhami: Differential Calculus, New Age International

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

PO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
M 301.1	3	1	1	-	-	-	-	-	-	-	-	1	1	1
M 301.2	3	2	1	-	-	-	-	-	-	-	-	1	2	2
M 301.3	3	2	2	-	-	-	-	-	-	-	-	1	2	1
M 301.4	3	2	2	-	-	-	-	-	-	-	-	1	1	1
M 301.5	3	3	2	3	-	-	-	-	-	-	-	1	1	1

Name of the Paper: Numerical Methods
Paper Code: M(CS)301
Contact (periods/week): L-T-P: 3L -0T-0P
Credit point: 3
Number of lectures: 3L

Prerequisite: Concept of Calculus and Algebra.

Course Objective:

The purpose of this course is to provide basic understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic.

Course outcome:

On successful completion of the learning sessions of the course, the learner will be able to:

M(CS) 301.1 Recall the distinctive principles of numerical methods
M(CS) 301.2 Determine the theoretical workings of numerical methods
M(CS) 301.3 Apply numerical methods to obtain approximate solutions to intractable mathematical problems such as system of linear and nonlinear equations
M(CS) 301.4 Analyse engineering problems by using numerical methods

MODULE I: NUMERICAL METHOD I

Approximation in numerical computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic.

(2L)

Interpolation: Newton forward/backward interpolation, Stirling & Bessel's Interpolation formula, Lagrange's Interpolation, Divided difference and Newton's divided difference Interpolation.

(7L)

Numerical integration: Newton Cotes formula, Trapezoidal rule, Simpson's 1/3 rule, Weddle's Rule, Romberg Integration, Expression for corresponding error terms.

(5L)

Numerical solution of a system of linear equations: Gauss elimination method, Tridiagonal matrix algorithm, LU Factorization method, Gauss-Seidel iterative method, Successive over Relaxation (SOR) method.

(6L)

MODULE II: NUMERICAL METHOD II

Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi, Secant Method, Newton-Raphson method.

(5L)

Numerical solution of ordinary differential equation: Taylor series method,Euler's method, Euler's method, fourth order Runge- Kutta method and Milne's Predictor-Corrector methods. (6L)

Numerical solution of partial differential equation: Finite Difference method, Crank–Nicolson method. (2L)

Text Books:

1.Shishir Gupta &S.Dey, Numerical Methods, Mc. Grawhill Education Pvt. Ltd.
2.C.Xavier: C Language and Numerical Methods, New age International Publisher.
3.Dutta& Jana: Introductory Numerical Analysis. PHI Learning
4.J.B.Scarborough: Numerical Mathematical Analysis.Oxford and IBH Publishing
5.Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).New age International Publisher.
6.Prasun Nayek: Numerical Analysis, Asian Books.

References:

1.Balagurusamy: Numerical Methods, Scitech. TMH
2.Baburam: Numerical Methods, Pearson Education.
3.N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4.SoumenGuha& Rajesh Srivastava: Numerical Methods, Oxford Universities Press.
5.Srimanta Pal: Numerical Methods, Oxford Universities Press.
6.Numerical Analysis, Shastri, PHI
7.Numerical Analysis, S. Ali Mollah. New Central Book Agency.
8.Numerical Methods for Mathematics ,Science&Engg., Mathews, PHI
9.NumericalAnalysis,G.S.Rao,New Age International
10.Programmed Statistics (Questions – Answers),G.S.Rao,New Age International
11.Numerical Analysis & Algorithms, PradeepNiyogi, TMH
12.Computer Oriented Numerical Mathematics, N. Dutta, VIKAS
13.NumericalMethods,Arumugam,ScitechPublication
14.Probability and Statisics for Engineers,Rao,ScitechPublication
15.Numerical Methods in Computer Application,Wayse,EPH

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
M (CS)301.1	3	2	1	-	-	-	-	-	-	-	-	-	-	
M (CS)301.2	3	3	2	1	-	-	-	-	-	-	-	2	1	-
M (CS)301.3	3	2	3	2	-	-	-	-	-	-	-	2	2	3
M (CS)301.4	2	3	2	2	-	-	-	-	-	-	-	1	3	3

Name of the Paper: Analog Electronic Circuits
Paper Code: EI 301
Contact (periods/week): L-T-P: 3L -0T-0P
Credit point: 3
Number of lectures: 35

Course Objective:

1.Provide a strong foundation on Linear Circuits.

2.Familiarize students with applications of various IC's.

3.Having a broad coverage in the field that is relevant for engineers to design Linear circuits using Op-amps.

4.Familiarize the conversion of data from Analog to Digital and Digital to Analog.

Course Outcome:

Course Outcome:

At the end of this course students will be able to

EI 301.1: **Explain** the characteristics of diodes and transistors
EI 301.2: **Analyse** various rectifier and amplifier circuits
EI 301.3: **Design** sinusoidal and non-sinusoidal oscillators
EI 301.4: **Design** OP-AMP based circuits
EI 301.5: **Design** ADC and DAC

Module I:

Small signal amplifiers: Introduction to Analog Integrated Circuits, BJT Modeling- hybrid model of transistors; Emitter follower circuits, High frequency model of transistors. FET Small signal analysis - Source follower

[3]

Module II:

Transistor Amplifiers: RC coupled amplifier, functions of all components, equivalent circuit, derivation of voltage gain, current gain, input impedance and output impedance, frequency response characteristics, lower and upper half frequencies, bandwidth, and concept of wide band amplifier.

[4]

Feedback Amplifiers & Oscillators: Feedback concept, Voltage series-shunt, current series-shunt feedback

Berkhausen criterion, Colpitts, Hartley's, Phase shift, Wien bridge and crystal oscillators [5]

Module III:

Operational Amplifier: Introduction to Integrated Circuits, Differential Amplifier, Constant current source (current mirror etc.), level shifter, CMRR, Open & Closed loop circuits, importance of feedback

loop (positive & negative), Block Diagram of OPAMP, Ideal OPAMP

[4]

Applications of Operational Amplifiers: analog adder, subtractor, integrator, differentiator, comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Analog multiplier, Precision Rectifier, voltage to current and current to voltage converter, free running Multivibrator , zero crossing detector [6]

Multivibrator – Monostable, Bistable, Astable multivibrators ; Monostable and astable operation using 555 timer.

[3]

Module IV:

Large signal Amplifiers: Introduction to power amplifiers (Class A, B, AB)

[1]

Power Supply:

Analysis for DC voltage and ripple voltage with C, L-C and C-L-C filters in Rectifier Circuit - Regulated dc power supplies- Line regulation, output resistance and temperature coefficient, Series and Shunt Voltage Regulation – percentage regulation, Fixed output voltage IC regulator 78xx and 79xx series , Adjustable output voltage regulator, LM 337 series power supply ICs , Concept of **Switched** Mode Power Supply` [6]

Text Books:

1.Millman Halkias – Integrated Electronics, McGraw Hill
2.Schilling & Belove—Electronic Circuit: Discrete & Integrated, 3/e, McGraw Hill
3.Ramakant A. Gayakwad —Op- Amps and linear Integrated Circuits, Pub: PHI
4.Boylested & Nashelsky- Electronic Devices and Circuit Theory- Pearson/PHI
5."Operational Amplifiers and Linear Integrated Circuits" by Robert F. Coughlin, Frederick F. Driscoll

Reference Books:

1.Rashid-Microelectronic Circuits- Analysis and Design- Thomson(Cenege Learning)
2.Linear Integrated Circuits – D. Roy Choudhury & Shail B. Jain
3.Analog Integrated Circuits – J. B. Gupta

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
EI 301.1	-	-	2	-	-	-	-	-	-	-	-	-	1	2
EI 301.2	1	-	1	3	-	-	-	-	-	-	-	-	2	1
EI 301.3	-	2	-	-	-	-	-	-	-	-	-	-	1	2
EI 301.4	1	-	-	3	-	-	-	-	-	-	-	-	2	1
EI 301.5	1	2	-	3	-	-	-	-	-	-	-	-	2	2

Name of the Paper: Digital Electronic Circuits
Paper Code: EI 302
Contact (periods/week): L-T-P: 3L
Credit point: 3
Number of lectures: 35

Course Objective:

1.To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.

2.To introduce number systems and codes.

3.To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions

4.To introduce the methods for simplifying Boolean expressions

5.Give students the basic tools for the analysis and design of combinational circuits and sequential circuits

6.To introduce the concept of memories, programmable logic devices and digital ICs.

7.To acquire the knowledge of Digital-to-Analog Conversion, Analog-to-Digital Conversion.

Course Outcome:

On completion of this Subject/Course the student shall be able to:
EI 302.1: Interpret of the fundamental concepts and techniques used in digital electronics.
EI 302.2: apply the concept of various number systems in digital design.
EI 302.3 solve complex circuit problem by applying knowledge of digital electronics
EI 302.4 analyze and design various cost effective combinational and sequential circuits.

Module1:

Introduction:

Digital system, Comparison between Analog and Digital system, Logic level, Element of Digital Logic, Functions of Digital logic.

Data and number systems:
Number system: Binary, Octal and Hexadecimal representation and their conversions;
Number Representation: Signed binary number representation with 1's and 2's complement methods, Fixed point - Floating point

Binary Codes: BCD- Gray code- Excess 3 code- Alpha Numeric codes – Error detecting and correcting codes- properties
Binary Arithmetic: Addition, subtraction, Multiplication, Division, Addition and subtraction by 1's and 2's complement, BCD addition and subtraction

[4]

Boolean algebra:

Theorems and operations, Boolean expressions and truth tables, Representation in SOP and POS forms Boolean functions; Minterm and Maxterm expansions Minimization of logic expressions by algebraic method, K-map method and Quine- McClauskey method

Various Logic gates- their truth tables and circuits; Design of circuits with universal gates. Exclusive-OR and Exclusive NOR and equivalence operations

[6]

Module II:

Design procedure–Adder: and Subtractor circuit: half and full adder and subtractor, BCD adder and subtractor, controlled invertor,
Convertors: BCD to excess-3 and vice versa, Binary to BCD, Gray to binary and viceversa.
Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and Checker.

[7]

Module III:

Sequential Logic:
Basic memory element-S-R, J-K, D and T Flip Flops-Truth table and Excitation table, Conversion of Flip-flop ,Various types of Registers and their design and application Synchronous and Asynchronous counters, Irregular counter- counter design

[5]

Sequential Circuits Design: State diagrams and tables, transition table, excitation table, Examples using flip-flops. Analysis of simple synchronous sequential circuits, construction of state diagram, State Machine-Mealy and Moore machine

[5]

Module IV:

Memory Systems:
RAM-Static RAM and Dynamic RAM, ROM, EPROM, EEROM
Programmable logic device: programmable read only memory, programmable logic arrays and programmable array logic, Design using PLA, PAL,PROM

[2]

Logic families:
TTL, ECL, MOS and CMOS, their operation and specifications: Logic levels, propagation delay time, power dissipation fan-out and fan-in, noise margin.
Implementation of Logic gate using TTL,MOS

[2]

Different types of A/D and D/A :
Conversion techniques: analog-to- digital (successive approximation, Dual slope, flash) and digital-to-analog converters (weighted R, R-2R ladder and current steering logic). Characteristics of ADC and DAC (resolution, quantization, significant bits, conversion/settling time)

[4]

Text Books:

1.A.Anand Kumar, Fundamentals of Digital Circuits- PHI
2.Morries Mano- Digital Logic Design- PHI
3.R.P.Jain—Modern Digital Electronics
4.Digital Integrated Circuits -- Taub and Schilling . Mcgraw Hill

Reference Books:

1.Digital Fundamental, Floyd-PHI
2.Digital, Principle and Application, Leach Malvino,Mcgraw Hill

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
EI 302.1	3	3	2	2	2	-	-	-	-	-	-	1	1	2
EI 302.2	3	2	2	-	-	-	-	-	-	-	-	2	2	1
EI 302.3	3	2	2	2	-	-	-	-	-	-	-	1	1	2
EI 302.4	2	3	2	2	-	-	-	-	-	-	-	2	2	1

Name of the Paper: Circuit theory and networks
Paper Code: EI 303
Contact (periods/week): L-T-P: 3-1-0
Credit point: 4
Number of lectures: 43

Pre-Requisite: Concept of Basic electrical
Course Objective:

1.To prepare the students to have a basic knowledge in the analysis of Electric Networks

2.To solve the electrical network using mesh and nodal analysis by applying network theorems

3.To analyze the transient response of series and parallel circuits and to solve problems in time domain using Laplace Transform.

4.To understand the concept of resonance in series and parallel circuits.

5.To design various types of filters.

6.To relate various two port parameters and transform them.

Course Outcome:

On completion of this Subject/Course the student shall be able to:

EI 303.1: Find out resonance of series & parallel resonant circuit
EI 303.2: Explain dynamic performance of the networks using Laplace Transform.
EI 303.3: Determine two port networks parameters
EI 303.4: Solve complex circuit problem by applying knowledge of circuit theorems
EI 303.5: Design different types of filters

Module1:
Introduction: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Source Transformation, Star-Delta conversation [4]

Network equations: Kirchoff's Voltage Law & Current Law, Formulation of network equations, Loop variable analysis, Supermesh Analysis, Node variable analysis, Supernode Analysis
Network theorem: Superposition, Thevenin's, Norton's,Maximum power transfer, Compensation & Reciprocity theorem. Millman's theorem and its application. Solution of Problems with DC & AC sources. [7]

Module II:
Laplace transforms: Concept of complex frequency, properties of Laplace Transform, Initial Value Theorem and Final Value Theorem, Concept of Convolution theorem and its application, Transformation of step, ramp, impulse, exponential, damped and undamped sine & cosine functions. Laplace Transform of Gate function & its application. Laplace transform of Periodic function. Inverse Laplace Transform, application of Laplace Transform in circuit analysis. [7]

Circuit Transients: Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits. Transient analysis of different electrical circuits with and without initial conditions using AC & DC source. Solutions of Problems with DC & AC sources [5]

Module III:

Two port network analysis: Open circuit Impedance & Short circuit Admittance parameters, Transmission parameters, Hybrid parameters and their inter relations. Condition of Reciprocity & symmetry. Interconnection of two port networks. Solution of Problems with DC & AC sources. [6]

Resonant Circuits: Series and Parallel Resonance, Impedance and Admittance Characteristics, Quality Factor, Half-Power Points, Bandwidth, Solution of problems [4]

Module IV:

Graph of Network: Concept of Tree, Branch, Tree link, junctions, Incident matrix, Tie-set matrix and loop currents, Cut-set matrix and node pair potentials, duality of networks, solution of problems. [4]

Coupled circuits: Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Modeling of coupled circuits, Solution of problems. [4]

Filter Circuits: Analysis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of Problems [2]

Text Book:

1.Network Analysis, M.E.Van Valkenburg (Prentice H all)
2.Engineering Circuit Analysis, W.H.Hayt, J.E.Kenmerly, S.M.Durbin,(TMH)
3.Network and Systems, D.Roychowdhury,(New Age International)

References:

1.Network and Systems, Ashfaq Husain,(Khanna Book Publisher)
2.Modern Netwok Analysis, F.M.Reza & S.Seely, McGraw Hill.
3.Circuits and Networks: Analysis and Synthesis Paperback , A. Sudhakar, Shyammohan S. Palli (TMH)
4. Network Analysis And Synthesis, C L Wadhwa, ,(New Age International)

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 303.1	3	2	2	1	1	-	-	-	-	-	-	-	2	2
EI 303.2	3	2	1	2	2	-	-	-	-	-	-	-	2	1
EI 303.3	3	2	2	1	1	-	-	-	-	-	-	-	1	1
EI 303.4	3	2	1	1	1	-	-	-	-	-	-	-	1	2
EI 303.5	3	2	3	1	1	-	-	-	-	-	-	-	2	2

Name of the Paper: Electrical & Electronic Measurement &Instrumentation
Paper Code: EI304
Contact (periods/week): L-T-P: 3-1-0
Credit point: 4
Number of Lectures: 45

Course objective:

1.To understand students how different types of electrical and electronics meters work and their construction and applications.

2.To provide an extensive knowledge about standards and units of measurements.

3.To provide knowledge for the calibration and standardization of various instruments.

4.To provide students with opportunities to develop basic skills in the design of measuring equipments.

5.To familiarize the students with the available software for virtual instrumentation.

Course Outcome:

On completion of this Subject/Course the student shall be able to:

EI 304.1: Apply the knowledge to measure a particular parameter using an appropriate measuring instrument
EI 304.2: Analyze the process of calibration and standardization the instruments applying the knowledge of calibration .
EI 304.3: Apply the knowledge of the instrumentation and measurement systems in the real life applications
EI 304.4: Design measuring instruments on requirement basis.

Module I:

Introduction to Electrical & Electronic Measurement &Instrumentation
Static and dynamic characteristics of measuring instruments: Definitions of accuracy, precision, hysteresis, nonlinearity, sensitivity, speed of response, fidelity, static and dynamic error, Statistical analysis of errors [5]

Reliabity, MTTF, Bath tub curve [1]

Introduction to electrical voltmeters and ammeters: PMMC, MI, Electrodynamometer and Electrostatic instrument: Construction, Torque equation, Damping, range extension [7]

Module II:
Measurement of Resistance: Wheatstone bridge & Kelvin's Double bridge (DC Bridge), Loss of charge method, Meggar
Measurement of Capacitance: De Sauty's bridge & Schering bridge (AC Bridge)
Measurement of Inductance: Anderson bridge & Maxwell's inductance capacitance bridge (AC Bridge)

(*each bridge should cover: Bridge balance equation, Magnitude and phase balance of AC bridges, Phasor Diagram)

[7]

Localization of cable fault: Murray and Varley loop methods

[1]

Basic concept of Potentiometer, Wattmeter and Energy meter:

[3]

Module III:

PLL including VCO: Block diagram, circuit diagram, operation, modes Charge amplifier, Programmable gain amplifier [3]

True RMS voltmeter, Digital Voltmeter, Average responding AC voltmeter and Peak responding AC voltmeters, Digital frequency meter including V to F, F to V

[7]

Q meter [2]

Module IV:

Oscilloscopes and its applications: Oscilloscope Time Base, Triggering, Oscilloscope Controls, Oscilloscope Probes, Digital Storage Oscilloscope, Types of display devices. No of the lectures to be allotted for this section are [6]

Distortion Analyzer and Spectrum Analyzer

[1]

Interference Signals and their eliminations

[1]

Introduction to Virtual Instrumentation [1]

Text Books:

1.Golding E.W. & Wides F.C. : Electrical Measuring Instruments & Measurements ; Wheeler
2.Sawhney A K : A course in Electrical & Electronic Measurements & Instruments, Dhanpat Rai & Co.
3.Helfrick A.D. & Cooper W.D. : Modern Electronic Instrumentation & Measuring Instruments; Wheeler
4.Bell, David : Electronic Instrumentation & Measurement, Reston Publishers
5.D.C. Patranabis, Principles of Electronic Instrumentation, PHI
6.A. K. Ghosh, Introduction to Measurements and Instrumentation

References:

1.Harris, F. K. – Electrical Measurements, Wiley.
2.H.S. Kalsi, Electronic Instrumentation, Tata McGraw Hill
3.Reissland M.U.: Electrical Measurement, New Age International

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 304.1	3	3	1	2	1	1	1	1	1	1	1	3	2	1
EI 304.2	3	3	1	3	1	1	1	1	1	1	1	3	2	1
EI 304.3	3	2	3	3	1	1	1	1	1	1	1	3	1	2
EI 304.4	2	2	3	1	1	1	1	1	1	1	1	1	1	2

Name of the Paper: Numerical Methods Lab
Paper Code: M(CS)391
Contact (periods/week): L-T-P: 0L -0T-3P
Credit point: 2
Number of lectures: 33L

Prerequisite: Any introductory course on C/ Matlab.

Course Objective: The purpose of this course is to provide basic programming skills for solving the problems in numerical methods.

Course outcome:

On successful completion of the learning sessions of the course, the learner will be able to:
M(CS) 391.1: Remember basic command and scripts in a programming language (C/Matlab)
M(CS) 391.2: Understand the theoretical workings of numerical techniques with the help of C/ Matlab
M(CS) 391.3: Apply the programming skills to solve the problems using multiple numerical approaches.
M(CS) 391.4: Analyze if the results are reasonable and then interpret the results.

List of Experiments:

1.Assignments on Newton forward /backward, Lagrange's interpolation, Sterling & Bessel's Interpolation formula, Newton's divided difference Interpolation.
2.Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule and Romberg Integration.
3.Assignments on numerical solution of a system of linear equations using Gauss elimination, Tridiagonal matrix algorithm, Gauss-Seidel iterations. Successive over Relaxation (SOR) method, LU Factorization method.
4.Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Secant Method, Newton-Raphson method
5.Assignments on ordinary differential equation: Euler's method, Euler's modified method, Runge-Kutta methods, Taylor series method and Predictor-Corrector method.
6.Assignments on numerical solution of partial differential equation: Finite Difference method, Crank–Nicolson method.
7.Implementation of numerical methods on computer through C/C++ and commercial Software Packages: Matlab / Scilab / Labview / Mathematica/NAG (Numerical Algorithms Group/Python.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO1	PSO2
M(CS) 391.1	3	2	1	-	-	-	-	-	-	-	-	1	-	
M(CS) 391.2	3	2	2	-	-	-	-	-	-	-	-	1	1	
M(CS) 391.3	3	2	2	-	-	-	-	-	-	-	-	2	2	3
M(CS) 391.4	3	3	2	3	-	-	-	-	-	-	-	1	3	3

Analog Electronic Circuits Lab
Code :EI 391
Contacts : 3P
Credits : 2

Course Objective:

1.Understand the scope of modern electronics.
2.Describe models of basic components.
3.Design and construct simple electronic circuits to perform a specific function, e.g.,designing amplifiers, ADC converters etc.
4.Understand capabilities and limitations and make decisions regarding their best utilization in a specific situation.

Course Outcome:

At the end of this course students will be able to:
EI 391.1: Show the working of diodes, transistors and their applications.
EI 391.2: Design a common emitter/base/collector amplifier and measure its voltage gain.
EI 391.3: Design the different circuits of operational amplifiers.
EI 391.4: Design different types of filters and apply the same to oscillators and amplifiers.
EI 391.5: Design a circuit to convert an analog signal to digital one.

List of Experiments:

1.Study of ripple and regulation characteristics of full wave rectifier with and without capacitor filter

2.Construction of a R-C coupled amplifier & study of its input impedance, output impedance and frequency response

3.Study of timer circuit using NE555 & configuration for monostable & astable multivibrator

4.Study a linear voltage regulator using regulator IC chip

5.Construction of analog adder and subtractor using opamp

6.Construction of integrator and differentiator using opamp

7.Construction of precision rectifier using opamp

8.Construction of a simple function generator using opamp

9.Construction of a Schmitt trigger circuit using opamp

10.Design and testing of Wien bridge oscillator

11.Study and analysis of Instrumentation Amplifier

12.Extramural Experiment

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 391.1	-	-	2	-	-	-	-	-	-	-	-	-	1	2
EI 391.2	1	-	1	3	-	-	-	-	-	-	-	-	2	2
EI 391.3	-	2	-	-	-	-	-	-	-	-	-	-	2	1
EI 391.4	1	-	-	3	-	-	-	-	-	-	-	-	1	1
EI 391.5	1	2	-	3	-	-	-	-	-	-	-	-	2	2

Digital Electronic Circuits Lab
Code :EI 392
Contacts : 3P
Credits : 2

Course Objective:

To reinforce learning through hands-on experience with design, construction, and implementation of digital circuits.
To train students with all the equipment which will help in improving the basic knowledge

Course Outcome:

On completion of this course students will be able to:
EI 392.1: Identify the operation of various basic logic gates ICs to implement different digital circuits.
EI 392.2: Demonstrate the basic operation of different combinational circuits including arithmetic circuits
EI 392.3: Evaluate the applications of flip-flops as binary registers and counters used in large digital integrated circuits
EI 392.4: Design mini digital electronic circuit based systems.

List of Experiments:

1.Realization of basic gates using Universal logic gates

2.Code conversion circuits- BCD to Excess-3 & vice-versa

3.4-bit parity generator & comparator circuits

4.Construction of simple Decoder & Multiplexer circuits using logic gates

5.Design of combinational circuit for BCD to decimal conversion to drive 7segment display using multiplexer

6.Construction of simple arithmetic circuits-Adder, Subtractor

7.Realization of RS-JK & D flip-flops using Universal logic gates

8.Realization of Universal Register using JK flip-flops & logic gates

9.Realization of Universal Register using multiplexer & flip-flops

10.Realization of Asynchronous and Synchronous Up/Down counter

11.Design of Sequential Counter with irregular sequences

12.Realization of Ring counter

13.Extramural Experiment

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 392.1	2	3	2	2	2	-	-	-	-	-	-	1	2	1
EI 392.2	1	2	2	-	-	-	-	-	-	-	-	2	2	1
EI 392.3	2	2	2	2	-	-	-	-	-	-	-	1	1	2
EI 392.4	3	3	2	2	-	-	-	-	-	-	-	2	1	2

Circuits and Networks Lab
Code : EI 393
Contacts : 3P
Credits : 2

Course Objective:

1.To acquaint students with the simulation software such as MATLAB to carry out design experiments as it is a key analysis software of engineering design

2.To generate different signals and transform those to s- domain using MATLAB

3.To verify various network theorem and other network aspects using SIMULINK.

4.To provide basic laboratory experience with analyzing the frequency response of different filters using simulation software.

Course Outcome:

On completion of this Subject/Course the student shall be able to:
EI 393.1: Apply the techniques and skills of modern engineering tools necessary for engineering practice.
EI 393.2: Identify, formulate and solve engineering problems with simulation software.
EI 393.3: Analyze transient response of series /parallel R-L-C circuit using simulation software.
EI 393.4: Determine frequency response of different filters using simulation software

List of Experiments:

1. Introduction to MATLAB

2. Generation of Periodic, Exponential, Sinusoidal, Damped sinusoidal, Step, Impulse, Ramp signals using MATLAB in both discrete and analog form

3. Verification of Network Theorems using simulation software

4. Determination of Laplace transform and inverse Laplace transformation using MATLAB

5. Transient response in R-L and R-C Network: Simulation/hardware

6. Transient response in R-L-C Series circuits Network: Simulation and hardware.

7. Determination of Impedance (Z) and Admittance(Y) parameters of two port network

8. Frequency response of LP and HP filters: Hardware

9. Frequency response of BP and BR filters

10. Evaluation of convolution integral for periodic & non-periodic signal using MATLAB

11. Extramural Experiment

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 393.1	3	2	2	1	1	-	-	-	-	-	-	-	1	1
EI 393.2	3	2	1	2	3	-	-	-	-	-	-	-	1	1
EI 393.3	2	2	2	3	3	-	-	-	-	-	-	-	1	1
EI 393.4	1	2	1	1	1	-	-	-	-	-	-	-	1	1

Technical Skill Development
Paper Code: MC 381
Contact (periods/week): L-T-P: 2-0-0
Credit point: 0

Course Objective:

1. Developing Knowledge about basic signal concept.

2. Understanding the LTI system modelling using MATLAB

3. The knowledge about the application and use of mathematical transforms.

4. Development of the mathematical skills to solve problems involving convolution using MATLAB

Course outcome:

MC 381.1: Student will be able to Explain commonly used signals through mathematically

MC 381.2: Student will be able to determine the response of LSI system using convolution.

MC 381.3: Student will use the tool to analyse continuous-time and discrete-time Fourier series.

MC 381.4: Student will be able to develop the continuous-time and discrete-time signals and systems.

ModuleI:
Skill development for signal simulation and analysis using MATlab [14]

Text Book:

1. Linear System and Signals, 2nd Edition by B.P.Lathi, Oxford University Press
2. Signals and systems with MATlab computing and simulink modeling- Steven T. Karris, Orchard Publications

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MC 381.1	3	3	1	2	1	1	1	1	1	1	1	3	2	1
MC 381.2	3	3	1	3	1	1	1	1	1	1	1	3	2	1
MC 381.3	3	2	3	3	1	1	1	1	1	1	1	3	2	1
MC 381.4	2	3	3	1	1	1	1	1	1	1	1	3	2	1
MC 381.5	2	3	3	2	1	1	1	1	1	1	1	3	2	1

2nd Year: 4th SEMESTER

A: THEORY:

	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	BS	PH401	Physics – II	3	0	0	3	3
2	PC	EI 401	Sensors and Transducers	3	1	0	4	4
3	PC	EI 402	Microprocessors and Microcontrollers	3	1	0	4	4
5	PC	EI403	Electromagnetic Theory and Transmission Line	3	0	0	3	3
6	PC	EI404	Signals & systems	3	0	0	3	3
Total Theory							17	17

B.PRACTICAL & SESSIONAL:

	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	BS	PH 491	Physics –II Lab	0	0	3	3	2
2	PC	EI 491	Sensors and Transducers Lab	0	0	3	3	2
3	PC	EI 492	Microprocessor and Microcontrollers Lab	0	0	3	3	2
4	PC	EI493	Electrical & Electronic Measurement & Instrumentation Lab	0	0	3	3	2
Sessional :								
5	HU	HU 481	Technical report writing & language practice laboratory	0	0	2	2	1
Total practical							14	9
Total 4th semester							31	26

Paper Name: Physics –II

Paper Code: PH 401

Total Contact Hours: 33

Credit: 3

Pre requisites: Knowledge of Physics up B. Tech. 1st year Physics-I course

Course Objective:

The Physics-II course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcome

PH 401.1**:** Define and understand electrostatics, magnetostatics and electromagnetic theory, operator formalism in Quantum Mechanics, categories of storage devices, materials of low-dimensions and fundamental particles.

PH 401.2**:** Apply the knowledge of Schrödinger equation in problems of junction diode, tunnel diode, Electromagnetic theory in communication and networking, Poisson's equations in various electronic systems, Fermi levels in intrinsic and extrinsic semiconductors.

PH 401.3 **:** Analyze the Role of quantum confinement in inducing novel features of a nano material, Change in electric and magnetic fields in various symmetrical bodies,

PH 401.4 **:** Compare different dimensions of nano materials

Course contents

Module 1: Electric and Magnetic properties of materials (8L)

Module 1.01:Insulating materials:

Dielectric Material: Concept of Polarization, the relation between **D, E** and **P**, Polarizability, Electronic (derivation of polarizability), Ionic, Orientation & Space charge polarization (no derivation), behavior of Dielectric under alternating field (qualitative discussion only), Local electric field at an atom: Lorentz field, Lorentz relation; Dielectric constant and polarizability – Clausius-Mossotti equation (with derivation) ; Dielectric losses. ferroelctric and piezoelectrics (Qualitative study).

4L

Module 1.02: Magnetic materials and storage devices:

Magnetic Field & Magnetization M, relation between **B, H, M**. Bohr magneton, susceptibility, Diamagnetism-&Paramagnetism - Curie law (qualitative discussion), Ferromagnetism– Curie Temperature, Weiss molecular field theory (qualitative) & Curie-Weiss law, concept of θp , Hysteresis, Hard ferromagnets, Comparison and applications of permanent magnets (storage devices) and Soft ferromagnets (Permalloys, Ferrites etc.) **4L**

Module 2: Quantum Mechanics-II (7L)

Formulation of quantum mechanics and Basic postulates- superposition principle, orthogonality of wave function, expectation value; operator correspondence, Commutator. Measurements in Quantum Mechanics-Eigen value, Eigen function, Schrödinger's equation as energy eigen value equation.

4L

Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well; Discussion on degenerate levels), 1D finite barrier problem and concept of quantum tunnelling (solve only E<V0). **3L**

Module 3: Statistical Mechanics (6L)

Module 3.01: Basics of Statistical Mechanics:

Concept of energy levels and energy states, Microstates, macrostates and thermodynamic probability, MB, BE, FD, statistics (Qualitative discussions)- physical significance, conception of bosons, fermions, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, Concept of Fermi level. **4L**

Module 3.02: Applications of Statistical Mechanics:

Qualitative study: Fermi level in metals, total energy at absolute zero and total number of particles.Fermi level for intrinsic and extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p type, n-type).**2L**

Module 4:Elements of solid state physics (6L)

Module 4.01: Free electron theory (qualitative) - Electronic conduction in solids :Drude's theory, Boltzmann equation, Wiedemann Frantz Law, Idea of quantization of energy-Sommerfeld theory. 3L

Module 4.01: Band theory of solids: Bloch Theorem-statement only, Kronig-Penny model (qualitative treatment)-Energy-band (E-k) diagram, allowed and forbidden energy bands, Brillouin Zone (qualitative study), Concept of effective mass – electrons and holes, crystal momentum, Hall effect-applications. 3L

Module 5: Physics of Nanomaterials (3L)

Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Quantum size effect and Quantum confinement. Carbon allotropes.Application of nanomaterials(CNT, grapheme, electronic, environment, medical). 3L

Module 6: Nuclear energy as future energy (3L)

Nuclear Binding Energy, Liquid drop model, Concept of Nuclear Fission, Nuclear Fusion & Energy output , Nuclear Reactor. **3L**

Reference Books

1.Insulating Materials:Principles, Materials,Applications, Margit Pfundstein, Roland Gellert,Martin Spitzner& AlexanderRudolphi: BirkhauserVerlag AG; 1 edition (1 April 2008)

2.High Voltage and Electrical Insulation Engineering, RavindraArora, Wolfgang Mosch: Online ISBN: 9780470947906 DOI:10.1002/9780470947906, Series Editor(s): Mohamed E. El-Hawary

3.Physics of Oscillations and Waves, N.K. Bajaj ,Publisher: McGraw-Hill Education –Europe

4.Waves and oscillations, Dr.P.K Mittal & Prof Jai DEV ,AnandHarAnand publications

5.Fundamental of Statistical Mechanics: B Laud

6.Introduction to statistical mechanics : .Pathria

7.Fundamental of Statistical and Thermal Physics: .F. Reif

8.Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2, Edward M Purcell

9.Introduction to Electrodynamics- Griffiths David J.

10.The Feynman Lectures on Physics. 2 (2nd ed.)Feynman, Richard P, Addison-Wesley.

11.Etching of Crystals-Theory, Experiment and Application, K Sangwal

12.Nanostructure and Nanomaterials, B.K. Parthasarathy

13.Introduction toNanotechnology, B.K. Parthasarathy

14.Essentials of Nanotechnology, RishabhAnand

15.Nanomaterials Handbook(Advanced Materials and Technologies)-YuryGogotsi (Editor)

16.Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)

17.Nuclear Physics,Irvin Keplan

18.Nuclear Physics, J.Pearson, University ofManchester, 2008

19.Nuclear and ParticlePhysics**,** Jenny Thomas **-**University College London **,**2000

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PH401.1	3	1	-	-	-	-	-	-	-	-	-	1	3	2
PH401.2	3	2	-	-	-	-	-	-	-	-	-	2	3	3
PH401.3	2	3	-	-	-	-	-	-	-	-	-	1	3	1
PH401.4	1	2	2	3	-	-	-	-	-	-	-	1	3	3

Sensors and Transducers
Paper Code: EI 401
Contact (periods/week): L-T-P: 3L -1T-0P
Credit point: 4
Total number of lectures: 40
Course Objective:

To deals with various types of Sensors & Transducers and their working principle.
To deal with Resistive, Capacitive and Inductive transducers.
To deals with some of the miscellaneous transducers.
To know the overview of different advance sensors.

Course Outcome:

Students should be able to
EI401.1: Illustrate the fundamental principles of various types of sensors.
EI401.2: Illustrate the different types of transducers available.
EI401.3: Use appropriate sensors to perform engineering tasks and scientific researches.
EI401.4: Design of different Sensors.
EI401.5: Design the basics of modern sensors

Module I:

Introduction to Measurement system, Block diagram,Static Characteristics, Dynamic characteristics, Basic Function, Error estimation, Sensitivity calculation, Resistive Transducer- Resistive potentiometer, Introduction to Strain gauge, Derivation of Gauge factor, Temperature compensation (2-wire,3-wire arrangement), Temperature compensation (use of dummy Gauge), Classification of strain gauge, Application of strain gauge 10L

Module II:

Capacitive Transducers, Sensitivity calculation, Applications, Piezoelectric Transducers, Piezo materials and devices, Peizo electric applications, Basic Principle of Inductive sensor, Mutual Inductance, LVDT, LVDT and its Applications; linear part of LVDT 8L

Module III:
Tachometers, Application of Tachometer and stroboscope, Seismic Accelometer, Proximity sensor, Operation of pneumatic load cell, Elastic Devices, Hall sensors, Radio Active sensors: Geiger counter,
Scintillation detector 8L

Module IV:

IC temperature Sensor, Electrochemical Gas sensors, Fibre optic sensors, Thick film technology, MEMS sensors, Nano sensors, Sensors for intelligent systems, Introduction to Smart sensors, Sensor network
,Wireless Sensor networks 8L

TEXT BOOKS-

1.Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 1999.
2.John Brignell,"Intelligent Sensor Systems", CRC Press; 2nd Revised edition edition,1996

REFERENCES-

1.Doebelin. E.A, "Measurement Systems – Applications and Design", Tata McGraw Hill, New York, 2000.
2.John. P, Bentley, "Principles of Measurement Systems", III Edition, Pearson Education, 2000.
3.Murthy.D.V.S, "Transducers and Instrumentation", Prentice Hall of India, 2001.
4.Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, DhanpatRai& Company Private Limited, 2007.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI401.1	2	3	1	2	-	-	-	-	-	-	-	-	2	1
EI401.2	1	1	-	3	2	2	1	-	-	-	-	-	2	2
EI401.3	1	2	3	1	2	2	-	-	-	-	-	-	1	2
EI401.4	2	2	2	1	3	-	-	-	-	-	-	2	1	1
EI401.5	2	1	2	1	2	-	-	-	-	-	1	1	2	2

Microprocessors and Microcontrollers
Paper Code: EI 402
Contact (periods/week): L-T-P: 3L -0T-0P
Credit point: 3
Total number of lectures: 34

Course Objective:

To understand the architectures of 8085 & 8086 microprocessors and 8051 microcontroller.
To familiarize with the assembly level programming technique.
To understand interfacing of 8 bit microprocessor /microcontroller with memory and peripheral chips involving in system design.
To be able to design a microprocessor /microcontroller based system.

Course Outcome:

On completion of this course, students will be capable of

EI402.1: Apply the knowledge of the internal architecture 8085/8086 microprocessors and 8051 for a specific application.
EI402.2: Analyzing various instructions related to particular programs for specific applications.
EI402.3: Analyzing the concept of interfacing circuits to some real time applications
EI402.4: Designing various microprocessor and microcontroller based systems for a specific application.

Module I:

Introduction to microprocessors:

Introduction to microprocessors, Evolution of microprocessors, The 8085 Internal architecture, Pin Diagram Instruction set and Assembly Language Programming. Addressing Modes.

7L

Module II

Microprocessor Related Operations:

The 8085 microprocessor: Timing diagrams, Stack and subroutine related operation, Counter and Time delay generation, Interrupt systems, DMA operation, Introduction to Serial Communication

7L

Module III

Peripherals interfacing techniques with 8085:

Interfacing memory, Interfacing I/O devices. Programmable peripheral devices (PPI) – Intel 8255, Programmable interval timer – Intel 8254, A/D and D/A converters **6L**

Module IV

Intel 8086/8088 Microprocessor:

Architecture, Register organization, Clock Generator, Resetting the microprocessor, Wait State Inserting, Bus Buffering, Pin details, Assembly Language Programming and Addressing Modes, Interrupts **6L**

Module V

Introduction to single chip microcontrollers:

Intel MCS-51 family features, 8051/8031 architecture, pin configuration, I/O ports and Memory organization. Instruction set and basic assembly language programming. Timer/Counter and Serial Communication, Interrupts.

Assembly language programming using 8051:

Moving data, external data moves, code memory read only data moves, PUSH, POP, data exchanges

Logical instructions, Byte level, bit level instructions, ROTATE, SWAP instructions, Arithmetic instructions, Flags, incrementing, decrementing, addition, subtraction, multiplication, division, decimal arithmetic

Jump and Call instructions, Jump and Call ranges, subroutines and return instructions

MCS-51 applications: Square wave and pulse wave generation 6**L**

Module VI

Introduction to PIC micro-controller:

Architecture, pin details, memory layout **2L**

TEXT BOOKS-

1. Douglas V. Hall – Microprocessors & Interfacing, Tata McGraw-Hill

2. Ramesh S. Gaonkar , Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989.

3. Ray & Bhurchandi – Advanced Microprocessors & Peripherals, Tata McGraw-Hill

4. Kenneth J. Ayala – The 8051 Microcontroller, Architecture, Programming and Applications, West Publishing Company

REFERENCES-

1. B.Ram , Fundamental of Microprocessor and Microcontrollers, Dhanpat Rai Publications.

2. Intel Corp: The 8085 / 8085A. Microprocessor Book – Intel marketing communication, Wiley interscience publications, 1980.

3. Walter A. Tribel – The 8088 and 8086 Microprocessors, Pearson Education

4. Barry B. Brey – The Intel Microprocessors, PHI/Pearson Ed. Asia

5. Muhammed Ali Mazidi and Janice Gillispie Mazidi – The 8051 Microcontroller and Embedded Systems, Pearson Education Inc.

6. Ajay V Deshmukh – Microcontrollers Theory and Applications, Tata McGraw-Hill

7. Myke Predko, Programming and Customizing the PIC Microcontroller (Tab Electronics).

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI402.1	3	2	2	2	2	2	1	1	1	1	1	3	1	2
EI402.2	3	3	2	3	2	2	1	1	1	1	1	3	2	1
EI402.3	3	2	3	2	2	2	1	1	1	1	1	3	2	2
EI402.4	3	2	3	3	2	2	1	1	1	1	1	3	1	1

Electromagnetic Theory and Transmission Line
Paper Code: EI-403
Contact (periods/week): L-T-P: 3-0-0
Credit point: 3
Total number of lectures: 35

Course Objectives:

1.To acquire the knowledge of Electromagnetic field theory that make the student to get a theoretical foundation to be able in the future to design emission , propagation and reception of electromagnetic wave systems

2.To identify , formulate and solve the problems related to fields and electromagnetic waves propagation in a multidimensional frame

3.Understand the basic concepts of electric and magnetic fields

4.To provide the students with a solid foundation in engineering fundamentals required to solve problems and also to pursue higher studies

5.Understand the concept of conductors, dielectrics, inductance and Capacitance, Gain knowledge on the nature of magnetic materials. Understand the concept of static and time varying fields.

Course Outcomes:

Student will be able to:
EI403.1: understand and interpret the physical meanings of gradient, divergence and curl, vector calculus and orthogonal coordinates.
EI403.2: understand the thorough treatment of the theory of electro dynamics, mainly from a classical field theoretical point of view, and includes such things as electrostatics and magneto statics, boundary conditions
EI403.3: apply the concept of steady fields and different associated laws in different cases and mediums and realize the physical significances of Maxwell's equations for static field.
EI403.4: solve different problems of the time varying fields and correlate the Poynting vector and Poynting theorem.
EI403.5: analyze the wave equations, and be able apply the concepts in transmission line, wave guide.
EI403.6: Analyze universal concepts in three-dimension real world, i.e., electro-magnetic wave propagation in free-space, dielectrics, conductors.

Module I

Introduction to the Electromagnetic Theory,Vector calculus – orthogonal Coordinate Systems, Curvilinear co-ordinate system (basics). Transformations of coordinate systems; Del operator; Gradient, Divergence,

Curl – their physical interpretations; Divergence Theorem, Stoke's Theorem, Laplacian operator

6L

Module II

Coulomb's law, electric field intensity, charge distribution.; Gauss' law, flux density and electric field intensity.. Current Densities, Conductors, Poisson's & Laplace's equations, Uniqueness theorem, Biot-Savart law, Ampere's law, Relation between J & H, Vector magnetic Potential. Maxwell's equations for static field. Study of different Applications on static fields using MATLAB Programming

6L

Module III

Faraday's law & Lenz's law, Displacement Current, J C – J D Relation, Maxwell's equations for time varying field, Time harmonic fields, Maxwell's equations for time harmonic field, Wave Equation, Boundary Conditions between media interface; Uniform Plane wave; Wave Propagation in Lossy Dielectric, Loss-less Dielectric, Free space, good conductor, skin effect and skin depth. Poynting Theorem, Power flow, Poynting vector. Wave polarizations **9L**

Module IV

Transmission Lines: Concept of Lump parameters and Distributed parameters, Line Parameters, Transmission line equations and solutions, Physical significance of the solutions. Propagation constant, Characteristic Impedance; Wavelength; Velocity of Propagation, group velocity , phase velocity; Distortion-less Line, Reflection and Transmission coefficients; Standing Waves, VSWR, Input Impedance, Smith chart, Load Matching Techniques. **9L**

Module V

Transmission line at microwave frequency; brief of rectangular waveguide, circular waveguide, resonators, concept of cavity, Basics of Antenna

5L

Text Books:

1.Mathew N.O.Sadiku , Principles of Electromagnetics, 4th Edition

2.W.H. Hayt & J.A. Buck, Engineering Electromagnetics, 7th Edition, Tata- McGraw-Hill

. 3.Edminister , Theory anmd Problems of Electromagnetics , 2nd Edition, Tata-McGraw- Hill

References:

1.S.P.Seth, Elements of Electromagnetic Fields

2.Syed Hasan Saeed And Faiza narif Khan , Electromagnetic Field Theory, G.S.N. Raju , Electromagnetics Field Theory & Transmission Lines, Pearson

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI403.1	3	3	1	2	1	1	1	1	1	1	1	2	3	3
EI403.2	3	3	1	3	1	1	1	1	1	1	1	2	3	2
EI403.3	3	3	1	3	1	1	1	1	1	1	1	2	2	2
EI403.4	3	3	1	3	1	1	1	1	1	2	1	3	2	2
EI403.5	3	3	2	3	2	1	1	1	1	2	1	1	2	3
EI403.6	3	3	2	3	2	2	1	1	1	1	1	1	2	3

Name of the Paper: Signals And Systems
Paper Code: EI-404
Contact (periods/week): L-T-P: 3-0-0
Credit point: 3
Number of lectures: 33

Pre requisite: First year courses (semester I & II)

Concepts in electrical and electronics circuits (Basic Electrical and Electronics Engg I & II).

Knowledge in algebra and calculus with problem solving capability (studied in Math-I).

Fundamental concepts on Fourier Transformation (studied in Mathematics-II)

Course Objectives:

The scope of this paper is to introduce the fundamentals of signals & systems so that the students may understand the basic concepts of various systems and signal processing and the way the signals interact with the physical systems.
Understanding of this subject is prerequisite to study the subjects control theory and DSP in upcoming semester.
It is needful for development of fundamental concepts in communication engineering in general.

Course Outcome:

EI 404.1 : Student will be able to describe commonly used signals mathematically and understand the classification of signals and how to perform mathematical operations on the signal and system.

EI 404.2: Student will be able to classify systems based on their properties and determine the response of LSI system using convolution.

EI 404.3: Student will understand continuous-time and discrete-time Fourier series/transforms

EI 404.4: Student will understand the process of sampling and the effects of under sampling.

EI 404.5: Student will be able to apply Z- transform for analyze of continuous-time and discrete-time signals and systems.

Module -1 :

Introduction to signal and systems: Continuous and discrete time signals: Classification of Signals , Periodic aperiodic even , odd , energy and power signals. Deterministic and random signals , complex exponential and sinusoidal signals , periodicity , unit impulse , unit step ,Transformation of independent variable of signals: time scaling, time shifting. System properties: Linearity, Causality, time invariance and

stability. Dirichlet's conditions,

8

Module -2 :

Signal Transformation: Determination of Fourier series coefficients of signal .Fourier transformation of continuous and discrete time signals and their properties. , concepts of correlation. Parseval's theorem; Convolution in time (both discrete and continuous) and frequency domains with magnitude and phase response of LTI systems.

Sampling Theorem: Representation of continuous time signals by its sample –Types of sampling, sampling theorem. 13

Module -3 :

Z-Transforms: Basic principles of z-transform - z-transform definition –, Relationship between z-transform and Fourier transform, region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion

12

Text Books:

1.J.G.Proakis&D.G.Manolakis- Digital Signal Processing Principles, Algorithms and Applications, PHI.

2.A.V.Oppenheim, A.S.Willsky and S.H.Nawab -Signals & Systems, Pearson

2.S.Haykin&B.V.Veen, Signals and Systems- John Wiley

3.A.NagoorKani- Signals and Systems- McGraw Hill

References:

1.C-T Chen- Signals and Systems- Oxford

2.E WKamen&BS Heck- Fundamentals of Signals and Systems Using the Web and Matlab- Pearson

3.B.P.Lathi- Signal Processing & Linear Systems- Oxford

4.P.RameshBabu&R.Anandanatarajan- Signals and Systems 4/e- Scitech

5.S Ghosh- Signals and Systems- Pearson

6.Ashok Ambardar, -Analog and Digital Signal Processing- Thomson.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs for Course C3	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
EI404.1	3	2	3	2	-	-	-	-	-	-	-	1	2
EI404.2	3	2	3	2	-	-	-	-	-	-	-	1	2
EI404.3	3	1	3	2	-	-	-	-	-	-	-	1	3
EI404.4	3	1	2	2	-	-	-	-	-	-	-	1	3
EI404.5	3	1	2	3	-	-	-	-	-	-	-	1	3

Paper Name: Physics –II Lab

Paper Code: PH 491

Total Contact Hours: 33

Credit: 2

Pre requisites: Knowledge of Physics up B. Tech. 1st year Physics-I course

Course Objective:

The Physics-II course will provide exposure to the physics of materials that are applied in electrical engineering an insight into the science & technology of next generation and related technicalities through quantum mechanics advanced materials for electrical engineering concept of fundamental particles and associated applications in semiconductors

Course Outcome of Physics-II Course (Theoretical: PH 491)

Course Outcome

At the end of the course students' will be able to

PH 491.1 : demonstrate experiments allied to their theoretical concepts

PH 491.2 : conduct experiments using semiconductors , dielectric and ferroelectrics

PH 491.3 : classify various types of magnetic materials

PH 491.4 : participate as an individual, and as a member or leader in groups in laboratory sessions actively

PH 491.5 : analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments

Course contents:*At least 7 experiments to be performed during the semester

Experiments on Module 1: Electric and Magnetic properties of materials (8L)
1.Study of dipolar magnetic field behaviour.
2.Study of hysteresis curve of a ferromagnetic material using CRO.
3.Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.Measurement of Curie temperature of the given sample.
4.Determination of dielectric constant of given sample (frequency dependent)/Measurement of losses in a dielectric using LCR circuits.

Experiments on Module 2: Quantum Mechanics-II (6L)
1.Determination of Stefan's radiation constant.
2.To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells & measurement of maximum workable power.
3.Measurement of specific charge of electron using CRT.

Experiments on Module 4: Solid state physics (9L)

1.Determination of band gap of a semiconductor.
2.Determination of Hall co-efficient of a semiconductor and measurement of Magnetoresistance of a given semiconductor
In addition to regular 7 experiments it is **recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:
1.Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
2.Determination of thermal conductivity of a good conductor by Searle's method.
3.Study of I-V characteristics of a LED.
4.Study of I-V characteristics of a LDR
5.Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
PH 491.1	3	2	-	-	-	-	-	-	-	-	-	1	1	1
PH 491.2	1	2	-	3	-	-	-	-	-	-	-	1	1	1
PH 491.3	1	2	-	-	-	-	-	-	3	-	-	1	1	1
PH 491.4	1	2	-	-	-	-	-	-	-	3	-	1	1	1

Sensors and Transducers Lab
Code: EI 491
Contacts: 3P
Credits: 2

Course Objective:

1.To identify suitable instruments to meet the requirements of industrial applications
2.To learn about Resistive, Capacitive and Inductive transducers
3.It knows practically about the transducer used for the measurement of speed and pressure.
4.It deals with characteristics of transducers.

Course Outcome:

The students will be able to:
EI491.1: Illustrate the working of transducers and various transducers used for the measurement of various physical variables.
EI491.2: Analyze the characteristics of the transducers.
EI491.3: Estimate the design specifications of different transducers.
EI491.4: Design sensor based on the real time application.

LIST OF EXPERIMENTS-

1.Displacement measurement by using a capacitive transducer.
2.Pressure and displacement measurement by using LVDT.
3.Study of a load cell with tensile and compressive load.
4.Torque measurement Strain gauge transducer.
5.Speed measurement using magnetic proximity sensor.
6.Speed measurement using a Stroboscope.
7.Study of the characteristics of a LDR.
8.Pressure measurement using Piezo-electric transducer
9.Study of the Characteristics of Hall-effect transducer
10Extramural experiment

REFERENCES-

1.Patranabis. D, “Sensors and Transducers”, Prentice Hall of India, 1999.
2.Doebelin. E.A, “Measurement Systems – Applications and Design”, Tata McGraw Hill, New York, 2000.
3.John. P, Bentley, “Principles of Measurement Systems”, III Edition, Pearson Education, 2000.
4.Murthy.D.V.S, “Transducers and Instrumentation”, Prentice Hall of India, 2001.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 491.1	3	2	-	-	-	-	-	-	-	-	-	1	1	2
EI 491.2	1	2	-	3	-	-	-	-	-	-	-	1	2	1
EI 491.3	1	2	-	-	-	-	-	-	3	-	-	1	2	1
EI 491.4	1	2	-	-	-	-	-	-	-	3	-	1	1	2

Microprocessor and Microcontrollers Lab
Code :EI 492
Contacts : 3P
Credits : 2

Course Objective:

To enable the students analyze microprocessors and microcontrollers.

To grow programming concept using microprocessor.

To make students able to write programs, interface with peripherals and implement them in projects.

To be able to choice suitable microprocessors and microcontrollers for any design and implementations.

To be able to interfacing microprocessors and microcontrollers with peripherals device.

Course Outcome:

After completion of this course, the students will be able to
EI492.1: analyse assemble language program in 8085 and 8086 microprocessors to solve various complex engineering problem.
EI492.2: design microprocessor-based systems for real time applications.
EI492.3: design interfacing circuits to the microprocessor to communicate with external devices, which can be associated with public safety, health, security and other societal and environmental concerns
EI492.4: develop the microprocessor and microcontroller-based interfacing as per the requirements.

LIST OF EXPERIMENTS-

1.Familiarization with 8085 and 8051 trainer kit components.

2.Program development using basic instruction set (data transfer, Load/ Sore, Arithmetic, Logical) using 8085 trainer kit such as

3.Addition and subtraction

4.Copying and shifting a block of memory

5.Packing and unpacking of BCD numbers

6.Addition of BCD numbers

7.Binary to ASCII conversions

8.String matching

9.Multiplication of two numbers

10.Sorting of array of numbers

11.Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit, write subroutine for delay, reading switch state & glowing LEDs accordingly, finding out the frequency of a pulse train etc.

12.Study of 8051 Micro controller kit and writing programs as mentioned in section 2.

13.Extramural experiment

REFERENCES-

1.Ramesh S. Gaonkar, Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989.

2.Kenneth J. Ayala –The 8051 Microcontroller, Architecture, Programming and Applications, West Publishing Company

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI492.1	3	2	1	1	1	-	-	-	-	-	-	1	2	1
EI492.2	1	2	-	3	-	-	-	-	-	-	-	1	1	2
EI492.3	1	2	2	-	1	-	-	-	3	1	-	1	1	1
EI492.4	2	2	2	1	1	-	-	-	2	2	2	2	1	1

Electrical & Electronic Measurement & Instrumentation Lab
Code : EI 493
Contacts : 3P
Credits : 2

Course objective:

1.To understand how different types of bridge circuits are to be operated

2.To understand about different types of static and dynamic characteristics.

3.To understand the operation of VCO and PLL

4.To understand the operation of Digital Storage Oscilloscope

5.To familiarize the calibration procedure of different electrical meters

Course outcome:

On completion of this Subject/Course the student shall be able to:

EI 493.1: Apply the knowledge for calibration of different electrical meters.
EI 493.2: Relate different static and dynamic characteristics of a measuring instrument for a typical application.
EI 493.3: Analyze the measured data statistically.
EI 493.4: Construct a given signal using the knowledge of Digital Storage Oscilloscope.

List of Experiments:

1.Measure the resistivity of material using Kelvin Double Bridge
2.Measurement of Capacitance by De Sauty Bridge
3.Calibrate dynamometer type Wattmeter by potentiometer
4.Calibrate A.C. energy meter.
5.Measurement of Power using Instrument transformer
6.Study of Static Characteristics of a Measuring Instrument
7.Study of Dynamic Characteristics of a Measuring Instrument
8.Realization of a V-to-I & I-to-V converter.
9.Statistical analysis of errors in measurement.
10.Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).
11.Familiarization with Digital Storage Oscilloscope.
12.Extramural experiment

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 493.1	3	2	-	-	-	-	-	-	-	-	-	1	1	2
EI 493.2	1	2	-	3	-	-	-	-	-	-	-	1	1	2
EI 493.3	1	2	-	-	-	-	-	-	3	-	-	1	2	1
EI 493.4	1	2	-	-	-	-	-	-	-	3	-	1	2	1
EI 493.5	1	2	-	3	-	-	-	-	-	-	-	1	1	1
EI 493.6	2	2	-	2	-	-	-	-	1	-	-	1	1	1

Technical Report Writing & Language Practice laboratory
Code: HU481
Contact Hours/Week (P): 2
Credits: 1

Pre-requisite: A basic knowledge of listening and speaking skills and the ability to infer meaning from audio-video/online lessons.

Course Objective:
By the end of the course the student should be able to
Understand and make use of a wide taxonomy of listening skills & sub-skills for comprehending & interpreting data in English
Speak in English, using appropriate vocabulary and pronunciation in contextualized situations
Understand and put into effective practice the pragmatics of Group Discussion
Understand and write a detailed technical report as per organizational needs
Understand and interact in professional presentations and interviews

Course outcome:

HU481.1:Understand and make use of a wide taxonomy of listening skills & sub-skills for comprehending and interpreting data in English
HU481.2:Describe, analyze, converse and interact with others in English in spoken interpersonal exchanges in situations in public and professional life.
HU481.3:Appraise a problem or situation and participate in the modalities of a Group Discussion
HU481.4:Investigate, locate, identify and classify the technical details and user interface of a device or technical product or mechanism in a detailed technical report.
HU481.5:Identify, participate and formulate effective interpersonal for professional presentations and interviews.

Syllabus:

Module 1: The Need for a Language Laboratory [2L+2P]
(a)Introduction to the Language Lab
(b)Skill-building exercises in the lab

Module 2: Power Listening [2L+3P]
(a)Taxonomy of Listening Skills & Sub-skills [Aural Skimming, Scanning, Listening for Details, Note taking, Evaluative Listening, Empathetic Listening, Paralinguistic and Kinesic Inferencing] (b)Audio-based Lessons
(c) Repairing Listening 'Gaps' through Learner Feedback

Module 3: Speaking Skills [2L+6P]
(a)The Need for Speaking: Content and Situation-based speaking
(b)Speaking Activities: [Just a Minute, Paired Role Play, Situational Speaking Exercises]
(c)The Pragmatics of Speaking—Pronunciation practice and learner feedback.

Module 4: Group Discussion [2L+6P]
(a)Teaching GD Strategies

(b)In-house video viewing sessions
Group Activities [Topic Brainstorming, Situational Analysis, Frame Story]
(d)Extended Practice and feedback

Module 5: Writing a Technical Report[2L+6P]
(a)Organizational Needs for Reports and types
(b)Report Formats
(c)Report Writing Practice Sessions and Workshops

Module 6: SWOT Analysis [2L+3P]
(a)SWOT Parameters
(b)Organizational SWOT
(c) Case Study

Module 7: Presentation [2L+6P]
(a)Teaching Presentation as a Skill
(b)Speaking Strategies and Skills
(c)Media and Means of Presentation
(d)Extended Practice and Feedback

Module 8: Personal Interview [2L+3P]
(a)Preparing for the Interview: Interview Basics, Dressing and Grooming, Q & A
(b)Mock Interview sessions and feedback

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
HU 481.1	3	-	-	3	-	**3**	-	-	**3**	**3**	-	-	**1**	**2**
HU 481.2	2	3	2	3	-	**3**	-	-	**2**	**3**	-	1	1	2
HU 481.3	1	3	-	3	-	**2**	-	-	**2**	**3**	-	1	2	1

3rd Year,5th Sem

A.THEORY:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	HS	HU501	Environmental Science	2	0	0	2	2
2	PC	EI 501	Industrial Instrumentation	3	0	0	3	3
3	PC	EI 502	Analog & Digital Communication Theory	3	0	0	3	3
4	PC	EI 503	Control Engineering	3	0	0	3	3
5	PE	EI 504A / EI 504B/ EI 504C	Digital Signal Processing/ RF & Microwave Engineering/ Antenna Theory & Propagation	3	0	0	3	3
Total Theory							14	14

B.**PRACTICAL& SESSIONAL:**

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	PC	EI 591	Industrial Instrumentation Lab	0	0	3	3	2
2	PC	EI 592	Analog & Digital Communication Lab	0	0	3	3	2
3	PC	EI 593	Control Engineering Lab	0	0	3	3	2
4	PE	EI 594A / EI 594B / EI 594C	Digital Signal Processing Lab / RF & Microwave Engineering Lab/ Antenna & Propagation Lab	0	0	3	3	2
Sessional :								
5	**MC**	MC581	Technical Skill development-II	2	0	0	2	0
Total practical							14	8
Total 5th Semester							28	22

Course Name: ENVIRONMENTAL SCIENCE
Course Code: HU 501
STREAMS: AEIE, ECE, EE
CREDITS: 2L
TOTAL CONTACT HOURS: 22

Pre-requisite: Basic knowledge of Chemistry & Mathematics

Course Objective:

Be able to understand the natural environment and its relationships with human activities.
Be able to apply the fundamental knowledge of science and engineering to assess environmental and health risk.
Be able to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues.
Be able to solve scientific problem-solving related to air, water, noise & land pollution.

Course Outcome:

HU501.1 : Study the mathematics and calculations of population growth, material balance and sustainable development.
HU501.2 : Study the components and diversity of eco system.
HU501.3 : Study the fundamental knowledge of air pollution, calculations of earth's surface temperature, atmospheric window and lapse rate.
HU501.4 : Acquire fundamental knowledge of water pollution and its consequences knowledge and calculations regarding BOD, COD.
HU501.5 : Understand the basic concepts regarding noise and musical sound, decibel unit and its relation with sound intensity, reasons and consequences of noise pollution.
HU501.6 :Understand the concepts of land pollution and its remedies.

1.General **6L**

1.1 Natural Resources: Forest Resource, water resource, mineral resource, energy resources (renewable, non-renewable, potentially renewable)
1.2 Population Growth: Exponential Growth, logistic growth, Maximum sustainable yield
1.3 Disaster Management: Types of disasters (Natural & Man-made), Floods, Earthquake, Tsunamis, Cyclones, landslides (cause, effect & control)
1.4 Ecology & Ecosystem: Elements of ecology, definition of ecosystem- components types and function, Food chain & Food web, Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems
1.5 Environmental Management: Environmental impact assessment, Environmental laws and protection act of India, Different international environmental agreement.

2. Air pollution and control **6L**

2.1 Sources of Pollutants: point sources, nonpoint sources and manmade sources primary & secondary pollutant

2.2 Types of air pollutants: primary & secondary pollutant ; Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN, Smog (Photochemical smog and London smog),

2.3 Effects on human health & climate: Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion

2.4 Air pollution and meteorology: Ambient Lapse Rate, Adiabatic Lapse Rate, Atmospheric stability & Temperature inversion

2.5 control of air pollution (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury)

3. Water Pollution **6L**

3.1 Classification of water (Ground & surface water)

3.2 Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, heavy metals, pesticides, volatile organic compounds.

3.3 Surface water quality parameters: pH, DO, 5 day BOD test, BOD reaction rate constants, COD. Numerical related to BOD

Lake: Eutrophication [Definition, source and effect].

3.4 Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only),ground water pollution (Arsenic & Fluoride; sources, effects, control)

3.7 Quality of Boiler fed water: DO, hardness , alkalinity, TDS and Chloride

3.7 Layout of waste water treatment plant (scheme only).

4. Land Pollution **2L**

4.1 Types of Solid Waste: Municipal, industrial, commercial, agricultural, domestic, hazardous solid wastes (bio-medical), E-waste

4.2 Solid waste disposal method: Open dumping, Land filling, incineration, composting, recycling (Advantages and disadvantages).

5. Noise Pollution **2L**

5.1 Definition of noise, effect of noise pollution on human health,

5.2 Average Noise level of some common noise sources

5.3 Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L_{10} (18 hr Index) .

5.4 Noise pollution control.

References/Books

1.A Textbook of Environmental Studies, Shashi Chawla. Tata McGraw Hill Education Private Limited
2.Environmental Studies, Dr. J P Sharma, University Science Press
3.Environmental Engineering, J K Das Mohapatra, Vikas Publication

Course Name: INDUSTRIAL INSTRUMENTATION
CODE: EI501
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 35

Prerequisite: Knowledge of Sensor & Transducer

Course Objective:
To understand the importance of different industrial instruments.
To understand the working principle of different measuring instruments.
To measure different physical parameters like pressure, temperature, flow rate, level etc
To install the different instruments.

Course Outcome:

After completion of this subject students will be able to:

EI501.1: explain working principle of different measuring instruments

EI501.2: understand the specification of different instruments and advantages and disadvantages.

EI501.3: measure different physical parameters like pressure, temperature, flow rate, level etc

EI501.4: design different instruments and install the instruments

Module I : Measurement of Pressure and Vacuum : [5L]
Manometers – U tube, Inclined Tube and Well type Manometers, Characteristics of Elastic Pressure Sensor, Bourdon Tube Pressure Gauge, Diaphragm, Bellows, Capsule Gauge, Differential Pressure Gauge, Pressure Switch, DP transmitters, McLeod Gauge, thermal conductivity gauge, ionization gauge.

Module II : Flow rate Measurement: [11L]

Types of Flow, Reynolds's number, Bernoulli's Equation, Calibration of flow meters,
Head type flow measurement – analysis and calculation - orifice, venturi, pitot tube, flow nozzle,
Variable Area Flowmeters – Glass and metal tube rotameters,
Mass flow meters : Coriolis, Thermal, Impeller type, Electromagnetic
type, Ultrasonic type, Positive displacement type

Module III : Level Measurement: [5L]

Gauge glass, Bi-Colour, Magnetic and Reflex Level Gauge, Float and displacers type instruments, Hydrostatic type level measurement, Capacitive type level instrument, Ultrasonic and Microwave type level instruments

Module IV : Temperature Measurement: **[9L]**

Temperature scale, Thermometers: Liquid, vapour and gas filled: construction details and comparison, Bimetal elements, Thermostats,

RTD: review of materials, construction, types; measuring circuits, ranges, errors and minimization of errors,

Thermocouples: types, thermoelectric power, circuits, ranges, errors, cold junction compensation, compensating cables, Linearization techniques of thermocouples, Thermopile, thermowell. Thermistors, Radiation Thermometer sensors: spectral and other characteristics, Pyrometers.

Module V: **[5L]**

Installation of pressure measuring instruments and Temperature elements

Pneumatic Instrumentation : Flapper nozzle system - pneumatic force balance and motion balance system , Pneumatic Transmitter.

Hazardous Area Instrumentation: Basic Concept

Text Books:

1.D. Patranabis, 'Principles of industrial Instrumentation', TMH, New Delhi, 2nd Ed

2.S.K.Singh:'Industrial instrumentation And Control' TMH, New Delhi, Third edition,

3.Arun Kumar Ghosh: 'Introduction to Measurement & Instrumentation', PHI, New Delhi, 4th edition.

4.K.Krishnaswamy, S.Vijayachitra: 'Industrial Instrumentation',New age International Publishers, 2nd edition.

5.B. G. Liptak: 'Instrument Engineers Handbook', vol-I and vol-II, Chilton Book Co. Philadelphia

6.Ernest O. Doeblin, 'Measurement Systems – Application and Design', Tata-McGraw Hill

7.S.K.Sen, 'Measurement Techniques in Industrial Instrumentation',New Age International.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
EI501.**1**	3	2	3	-	-	-	3	-	-	-	1	2	3	2
EI501.**2**	-	-	1	-	-	-	-	-	-	-	-	-	2	2
EI501.**3**	2	-	2	-	1	-	**2**	-	-	-	-	-	1	2
EI501.**4**	-	-	2	-	-	**2**	**2**	-	-	-	-	-	2	2

ANALOG & DIGITAL COMMUNICATION THEORY
CODE: EI502
CONTACT: 3L
CREDITS: 3
TOTAL CONTACT HOURS: 34

Prerequisite: Signals and Systems, Analog and digital electronic circuits

Course Objectives:

To understand the building blocks of communication system.
To prepare mathematical background for communication signal analysis.
To understand and analyze the signal flow in a communication system.
To analyze error performance of a communication system in presence of noise and other interferences.
To understand concept of spread spectrum communication system.

Course Outcome

After completion of this subject students will be able to:

EI502.1: understand the performance of a baseband and pass band communication system in terms of error rate and spectral efficiency.
EI502.2: analyze the time and frequency domain analysis of the signals in a communication system.
EI502.3: analyze Performance of spread spectrum communication system
EI502.4: design the different types of communication system with different protocols.

Module I: Elements of communication system: [10L]

The basic elements of a communication system, Concept of transmitter and receiver, origin of noise and its effects in communication system, Concept and effects of SNR and its importance in system design.
Linear (AM) modulation, Generation and demodulation of AM wave. Concept of DSBSC, SSBSC and brief discussion of VSBSC. Concept of QAM.
Basic principle of nonlinear (FM, PM) modulation and their relations. Generation and demodulation of FM waves.

Module II: Sampling and Pulse Modulation techniques: [8L]

Sampling theorem, sampling rate, impulse sampling, natural & flat topped sampling, reconstruction of signal from samples, Concept of Aliasing and anti-aliasing filter.
Quantization noise, Uniform quantization, Non-uniform quantization, A-law and μ-law.
A/D and D/A conversion techniques, Concept of Bit rate, Baud rate, M-ary encoding.
Analog pulse modulation-PAM, PWM, PPM.

Fundamentals of PCM, Block diagram of PCM, basic concept of Delta modulation, Adaptive delta modulation.
Introduction to DPCM.
Different types of multiplexing: TDM, FDM.

Module III: Digital Transmission: : [8L]
Basic concept of Digital communication, comparative study of digital communication and analog communication.
Encoding, coding efficiency. Line coding & its desirable properties, Different types of line coding: NRZ & RZ, AMI, Manchester coding and their spectra.
Base band pulse transmission, optimum filter, Matched filter and correlation filter, Inter Symbol Interference (ISI), Eye pattern, Signal power in binary digital signal.

Module IV: Digital carrier modulation & demodulation technique: [4L]
Introduction to the digital modulation techniques- ASK. FSK, PSK, BPSK, QPSK, M-ary PSK and their comparisons.
Basic concept of spread spectrum modulation and CDMA.

Module V: Introduction to coding theory: [4L]
Introduction, Measurement of Information and its unit, Entropy, Mutual information, Information rate, Basic principle of error control & error correction coding.

Text Books:
1.Modern Digital and Analog Communication systems, B.P. Lathi, Oxford University press
2.An Introduction to Analog and Digital communication, Simon Haykin, Wiley India.
3.Analog communication system, P. Chakrabarti, Dhanpat Rai & Co.
4. Principle of digital communication, P. Chakrabarti, Dhanpat Rai & Co.
Reference Books:
1.Digital and Analog communication Systems, Leon W Couch II, Pearson, Education Asia.
2.Communication Systems (Analog and Digital), Dr. Sanjay Sharma, S. K. Kataria & Sons
3. Principles of Communication Systems, Taub and Schilling, Tata McGraw-Hill Education

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI502.1	1	2	2	2	3	2	2	3	2	2	1	1	2	2
EI502.2	1	2	1	3	2	1	1	2	3	1	2	3	2	1
EI502.3	2	2	3	2	2	3	3	2	2	2	2	2	2	1
EI502.4	1	3	2	3	3	2	2	3	3	3	2	2	2	2

CONTROL ENGINEERING
CODE: EI 503
CREDITS: 3
TOTAL CONTACT HOURS: 30
Prerequisite:

Knowledge of Signals & Systems
Basic Elements & Laws of circuits and Networks
Laplace Transformation and its application in different networks

Course Objective:

To construct the model of a physical dynamical system by a linear time invariant ordinary differential equation.
To analyze the under-damped, over-damped and critically damped cases of a second order system in time domain.
To illustrate the effects of poles and zeros location in the s-plane on the transient and steady state behavior of a system.
To determine the system stability in frequency domain.
To explain the effects of Lead, Lag and Lag-Lead compensator on second order system.

Course Outcome:

EI503.1:Apply Laplace transform and state space techniques to model dynamic systems.
EI503.2:Demonstrate an understanding of the fundamentals of control systems.
EI503.3:Analyze the system behaviour in frequency domain & the system stability using compensator.
EI503.4: Determine the time domain responses of first and second-order systems.

Module I: **[11L]**

Introduction to Elementary control concepts:-Brief introduction, Applications area. Open loop and close loop system and their comparison. Mathematical Model of Physical Systems:- Introduction, Differential equation representation of physical systems, Transfer function concepts, Block diagram algebra, Signal flow graphs :- Mason's gain formula. Time Response Analysis: - Introduction, Review of standard test signals-Step , Ramp , Impulse , sinusoid .Time response of first order system, Design specifications of first order systems, Time response of second order systems, Design specifications of second order systems.

Module II: **[8L]**

Stability Analysis in Time Domain: The concept of stability, Assessment of stability from pole positions, Necessary conditions for stability, Routh Stability Criterion, Relative stability analysis, Illustrative examples. Root Locus Technique: Introduction, The root locus concept, Root locus construction rules, Root contours, Advantages & limitations, Relative stability analysis using root locus.

Module III: **[11L]**

Frequency Response Analysis: Introduction, Performance Indices ,Frequency response of second order systems, Polar plots, Bode plots, All pass systems, Minimum-phase and Non-minimum-phase systems, Assessment of relative stability – Gain Margin and Phase Margin, examples. Stability Analysis in Frequency Domain: Introduction, A brief review of Principle of Argument, Nyquist stability criterion, Illustrative examples. Introduction to Design: The design problem, Concepts of cascade and feedback compensation, Realization of basic compensators- Lead, Lag, Lag-Lead compensator. State variables: Concepts of state, state variables and state model, State models of linear continuous-time systems, Concept on Controllability and Observability.

Text Books :

1.Modern Control. Engineering. Fifth Edition. Katsuhiko Ogata
2.CONTROL SYSTEMS: ENGINEERING, 5th Edition [I. J. Nagrath, M. Gopal]
3.Automatic Control Systems [Farid Golnaraghi, Benjamin C. Kuo]
4.Nagoor Kani. Edition, 2. Publisher, RBA Publications
5.Automatic Control Engineering, 5th Edition by Raven, Francis H at Biblio
6.Control Engineering: Theory and Practice [M. N. Bandyopadhyay]

Reference Books :

1.Book. Modern Control Engineering. Marcel Dekker, Inc. New York, NY, USA ©2001
2.Classical Feedback Control by B. Lurie and P. Enright

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P011	P012	PSO1	PSO2
EI503.1	3	2	-	-	1	-	-	-	-	-	-	-	2	2
EI503.2	1	2	-	3	-	-	-	-	-	-	-	-	1	1
EI503.3	1	-	2	-	-	-	-	-	-	-	-	-	1	2
EI503.4	3	3	1	2	-	-	-	-	-	-	-	-	2	1

DIGITAL SIGNAL PROCESSING
EI 504A
CONTACT: 3L
CREDITS: 3
TOTAL CONTACT HOURS: 34

Prerequisite: Analog Electronics circuit, Signals & Systems, Analog Filters

Course Objective:

To develop the knowledge on signals used in digital signal processing.
To impart the knowledge of the principles of discrete-time signal analysis to perform various signal operations
Apply the principles of Fourier transform analysis to describe the frequency characteristics of discrete-time signals and systems
To study various sampling techniques and different types of filters
To learn the use of computer programming tools to create, analyze process and visualize signals and to plot and interpret magnitude and phase of LTI system frequency responses
To understand the architecture of a digital signal processor and some programming issues in fixed-point digital signal processor in real-time implementation.

Course Outcome:

The students will be able to:
EI504A.1: recall the knowledge about continuous and discrete time signals

EI504A.2: Understand the Fourier Transform, and examine the process of Quantization and the effects of finite register length

EI504A.3: Understand and implement DFTs on long data sets such as speech signals and images.

EI504A.4: Develop different types of FIR & IIR filter structures and their implementations

EI504A.5: apply the concept of FFTs for efficient implementation of linear convolution

EI504A.6: design some projects related to the fields such as speech processing, audio signal processing, digital image processing, video and audio compression.

Module I:

LTI systems:

[6L]

Concept of signals & systems, digital signal processing and its relevance to digital communication. Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercise, properties of convolution, interconnection of LTI systems with physical interpretations, stability and causality conditions, recursive and non recursive systems.

Module II:

Discrete Time Fourier Transform(DTFT):

[2L]

Concept of frequency in discrete and continuous domain and their relationship (radian and radian/sec), freq. response in the discrete domain. Discrete system's response to sinusoidal/complex inputs (DTFT), Representation of LTI systems in complex frequency domain.

Discrete Fourier Transform: **[8L]**

Concept and relations for DFT/IDFT; Relation between DTFT & DFT; Twiddle factors and their properties; DFT/DFT as linear transformation and matrices ; Computation of DFT/IDFT by matrix method; Properties of DFT – periodicity, linearity, time reversal,circular time & frequency shift, symmetry, circular symmetry,duality, multiplication of two DFTs,circulation convolution, circular correlation ; Computation of circular convolution by graphical; Linear filtering using DFT, aliasing error, filtering of long data sequences- Overlap-Save and Overlap-Add methods.

Fast Fourier Transforms: **[4L]**

Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithm, signal flow graph, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises.

Module III:

Filter design:

[6L]

Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transform. Concept of Chebyshev filters and comparison with Butterworth filter. Design of linear phase FIR filters -no. of taps, rectangular, Hamming and Blackman windows. Effect of quantization. Some examples on practical filters.

Multirate Digital Signal Processing: **[2L]**

Introduction to multirate digital signal processing, Sampling rate conversion, multistage interpolator & decimator, digital filter banks.

Module IV:

Digital Signal Processor: **[6L]**

Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs.

Text Books :

1.Digital Signal Processing–Principles,Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.
2.Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
3.Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.
4.Digital Signal processing – A.V. Oppenheim,R.W.Schafer, Prentice Hall
5.Discrete-time Signal processing – A.V. Oppenheim,R.W.Schafer, John R. Buck, Prentice Hall

Reference Books :

1.Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
2.Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.
3.Digital Signal Processing; A Hands on Approach, C. Schuler & M.Chugani, TMH Publishing Co.
4.Digital Signal Processing,A. Nagoor Kani, TMH Education
5.Digital Signal Processing S. Poornachandra & B. Sasikala, MH Education
6. Digital Signal Processing; Spectral Computation and Filter Design Chi-Tsong Chen, Oxford University Press
7.Texas Instruments DSP Processor user manuals and application notes.
8. Digital Signal Processing: A MATLAB-Based Approach, V.K.Ingle and J.G.Proakis, Cengage Learning
9.;Modern Digital Signal Processing,V. Udayashankara, PHI Learning

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI504 A.1	3	3	1	1	1	1	1	1	1	1	1	1	1	1
EI504 A.2	3	3	1	2	1	1	1	1	1	1	1	1	2	2
EI504 A.3	3	3	1	3	3	3	1	1	1	1	1	1	2	1
EI504 A.4	3	3	3	3	1	2	1	1	1	1	1	1	1	2
EI504 A.5	3	3	3	3	3	1	1	1	1	1	1	1	1	1
EI504 A.6	3	3	3	3	3	3	3	3	3	3	3	3	1	1

RF & MICROWAVE ENGINEERING
EI 504B
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 34

Prerequisite: Analog Electronics circuit, Electrical and Electronic measurement systems, Transmission Line, Planar Transmission Line, Study of passive filter.

Course Objective:

To distinguish the RF & Microwave spectrum, Planar transmission lines and High frequency circuit elements.
To determine the Microwave passive components and Scattering matrix representation.
To illustrate the Microwave tubes, Semiconductor Microwave Devices.
To justify the microwave sensor and typical microwave test bench.

Course Outcome

EI504B.1: Able to understand and analyze Planar transmission lines and High frequency circuit elements.

EI504B.2: Able to illustrate the construction and working principle of Microwave tubes, Semiconductor Microwave Devices and their typical characteristics and applications.

EI504B.3: Able to understand the application of microwaves as a Duplexer, Radar etc.

EI504B.4: Able to demonstrate the measuring techniques of microwave devices such as Detector, Power meter and sensors, Slotted line, Spectrum analyzer, Mixer, Network analyzer.

Module I: Two Port RF Networks and Matching Techniques: [6L]
Introduction to RF & Microwave signal, Spectrum bandwidth and its necessity in communication system, Formulation of S- parameters, properties of S- matrix , S- matrices of series and shunt elements; Simulation of lumped elements; Impedance matching network design using lumped elements and quarter wave transformer microstrip line.

Module II: Microwave Passive Devices: [8L]
Microwave passive components and their S matrix representation: Waveguide attenuators, phase shifters, directional couplers, Magic tee, hybrid ring, circulators, isolators, filters design (maximally flat and equal ripple)using insertion loss method from low pass prototype design.

Module III: Microwave Active Devices [10L]
Vacuum Tubes*:* High frequency limitations; Principle of two cavity Klystron, Reflex Klystron, Traveling Wave Tube, Magnetron (only operating principles and applications). Microwave Semiconductor Devices:

Principles of detector and varactor diodes, Construction and Operating principles of Gunn diode, IMPATT diode, PIN diode- characteristics and applications, Operating principles of microwave bipolar transistor, microwave field effect transistor (MESFET).

Module IV: Applications of Microwaves [5L]

Radar systems-range equation, duplexer, pulse and CW radar; Principle of microwave communication, path loss; Industrial applications of microwaves- heating, thickness measurements, diathermy.

Module V: Instrumentations and Measurement Techniques: [5L]

Detector, Power meter and sensors, Slotted line, Spectrum analyzer, Mixer, Network analyzer, Microwave measurements: VSWR, power- low, medium, and high; frequency and wavelength; impedance, attenuation, and Q.

Text Books :

1. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc GrawHill Inc., 3rd Edn.2015.
2.Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2006.
3.D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006.

Reference Books :

1.Robert E.Colin, 2ed "Foundations for Microwave Engineering", McGraw Hill, 2001M.
2.M.Radmanesh, RF & Microwave Electronics Illustrated, Pearson Education, 2007.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI504B.1	**3**	-	-	-	-	-	-	-	-	-	-	-	2	2
EI504B.2	**1**	-	**1**	**3**	-	-	-	-	-	-	-	-	2	3
EI504B.3	**2**	-	-	-	-	-	-	-	-	-	-	-	2	3
EI504B.4	**2**	**1**	-	-	-	-	-	-	-	-	-	-	3	2

PAPER NAME: ANTENNA THEORY & PROPAGATION
PAPER CODE : EI 504C
CONTACTS : 3L/WEEK
CREDITS :3
TOTAL CONTACT HOURS :34

Prerequisite:
Basic concept of electromagneticwave, Maxwell's equation in differential and integral form and its interpretation. Vector calculas.

Course objectives:
To understand the fundamentals of antenna and its characteristics.
To understand the difference between different types of antenna and their characteristics
To understand radio wave propagation phenomena in communication systems
To understand the fundamentals of electromagnetic radiation with application to antenna theory and design

Course Outcome:
After successful completion of this course, students should be able to:
EI 504C.1: To analyze the fundamentals of antenna theory.
EI 504C.2: Understand the different types of antennas and the radiation mechanism.
EI 504C.3: To expose students to examples of applications and various antenna types.
EI 504C.4: Identify the atmospheric and terrestrial effects on radio wave propagation

Module -I [7L]
A. Antenna Introduction: Radiation of EM waves and introducing Antenna, Antenna in communication system; Its application.[2]
B. Antenna Characteristics: Radiation Pattern, Beam Width; Isotropic ,Omnidirectional radiation, Radiation Resistance and efficiency; Directivity and Gain; Impedance, VSWR, Polarization; Effective height and Receive Aperture; Noise Temperature of Antenna. [3] C. Link Budget; Radiation Hazards. [2]

Module-II [7L]
A. Radiation fields of a Hertzian dipole(electric);Radiation fields and Characteristics of λ/2 dipole; discussion on λ/4 monopole antenna; Current distribution and Radiation patterns of center-fed dipoles of length λ, 3λ/2 and 2 λ. Design of dipole antenna, Folded dipole, Yagi-uda Array [4]
B. Antenna Arrays: electric Field due to 2 element arrays, Pattern Multiplication; Uniform Linear Array: End fire and Broad side; Planar array;Phased array. [3]

Module-III [10L]
A. Characteristics , Properties: Travelling Wave Antenna, Helical Antenna, Loop Antenna, Electrically Short Antennas, Broad Band Antenna (Log periodic Antenna), Microstrip Patch Antenna (Broadband MSA). [6]
B. Radiation from an aperture: Sectoral and Pyramidal Horn Antennas, Parabolic and Corner Reflectors and feed systems. [4]

Module-IV [10L]

A. Different types of EM wave propagation:Ground wave, Ionospheric wave, Skywave Ground and their expression , Field strength dependence on physical factors. Virtual Height, Critical Frequency, MUF, Skip distance, Sporadic Reflections. Space wave propagation: Tropospheric Scatter, Ducting Super refraction, Sub refraction. [6]

B. Effects on atmospheric precipitations- Rain, Fog, Snow, Ice, and other atmospheric gases;Friss Transmission Formula, SNR of a Radio Link. Physical (Medium) effects on Radio wave Propagation: Absorption, Refraction and Radio Horizon, Diffraction, Multipath Propagation and fading, Noise, Doppler effect. [4]

Text Books

1.Antenna Theory-Analysis and Design, Third Edition, C.A.Balanis, Wiley-India, 2005
2.Antenna and Wave Propagation, First Edition, Sisir K Das and Annapurna Das, Tata-McGraw-Hill Education Pvt.Ltd., 2013
3.Jordan E.C. & Balmain K.G. " Electromagnetic Waves and Radiating systems ", Prentice Hall of India
4.Engineering Electromagnetics, 7thEdition-W.H.Hayt & J.A.Buck, Tata-McGraw-Hill

Reference Books

1.Fields & Waves in Communication Electronics, S. Ramo, J. R. Whinnery & T. Van Duzer, John Wiley
2. Electromagnetic Waves, R K Shevgaonkar,– Tata-McGaw-Hill
3.Electromagnetics, 2ed Edition – J A Edminister, Tata-McGraw-Hill.
4.Engineering Electromagnetics, 2ed Edition - Nathan Ida, Springer India
5.Microwave Engineering, 3rd Edition, Annapurna Das and Sisir K Das, Tata-McGraw-Hill Education Pvt. Ltd., 2015
6.Elements of Electromagnetics, 4th Edition, Matthew O H Sadiku, Oxford University Press

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

Course Outcome	**Programme Outcome**													
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
EI504C.1	3	-	3	-	2	2	-	2	2	-	-	1	3	3
EI504C.2	-	3	-	-	3			3	2	-	1	1	3	2
EI504C.3	3	-	3	-	3	2		2	2	-	-	2	3	3
EI504C.4	-	-	3	-	3	3		2	2	-	1	1	3	2

PAPER NAME: INDUSTRIAL INSTRUMENTATION LAB
PAPER CODE : EI 591
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3
CREDITS : 2

Course Objectives:

To understand the importance of calibration of different industrial instruments.

To measure different physical parameters like pressure, temperature, flow rate, level etc

To understand the working principle of different measuring instruments

To choose the suitable instrument for desired measuring parameter.

Course Outcomes:

After the completion of the course, the students will be able to:
EI591.1: describe the operating principles of different instruments.
EI591.2: measure different industrial parameter like pressure, temperature, flow, level etc.
EI591.3: choose the suitable instrument for desired measuring parameter.
EI591.4: design different smart instruments

Experiments:

1.Calibration of Pressure Gauge using Dead Weight Tester
2.Study of Thermocouple characteristics and Measurement of Temperature .
3.Study of Thermistor characteristics and Measurement of Temperature.
4.Study of RTD characteristics and Measurement of Temperature.
5.Measurement of temperature using AD590
6.Measurements of flow rate and velocity of fluid flow by head type flow meter.
7.Measurements of flow rate and velocity of fluid flow by Variable Area type flow meter
8.Measurement of level using capacitive type level instrument.
9.Measurement of moisture using moisture analyser
10.Measurement of viscosity

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PSO 2
EI 591.1	2	3	3	1	-	-	-	-	1	2	3	2	2	1
EI 591.2	1	2	2	1	-	-	-	-	-	-	1	2	1	2
EI 591.3	2	1	2	1	-	-	-	-	1	-	2	2	2	2
EI 591.4	1	3	2	1	-	-	-	-	-	-	1	2	1	1

ANALOG & DIGITAL COMMUNICATION LAB
CODE: EI 592
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3
CREDIT: 2
Course Objective:

The course objectives are to enable the students to
Understand the fundamental concepts of communication systems.
Understand and compare different analog modulation schemes.
Understand and compare different digital modulation schemes.
Understand the design tradeoffs and performance of communications systems.
Learn about practical communication systems

Course Outcome:

EI592.1: To learn signal and linear time invariant system properties.

EI592.2: Study, design, and build modulation systems examining trade-offs indifferent communication systems.

EI592.3: To be able to perform experiments in converting analog information into digital data via sampling, quantization, and coding.

EI592.4: To be able to choose necessary modulation technique for specific signal transmission.

Experiments: -

1.Observation of modulation index in Amplitude modulation and construction of envelope for different values of modulation index.
2.Observation and generation of Double Side Band Suppressed Carrier (DSB-SC) signal.
3.Observation and generation of Single Side Band Suppressed Carrier (SSB-SC) signal.
4.Observation of Frequency Modulation & Demodulation and calculation of modulation index.
5.Generation of Time Division Multiplexing (TDM) & Demultiplexing interlacing several sampled signal using PAM.
6.To interpret Pulse Amplitude Modulation (PAM) and demodulation for various modulating voltages.
7.Generation of Pulse Width Modulation (PWM) and demodulation for various modulating voltages.
8.To analyze a FSK modulation system and interpret the modulated and demodulated waveforms.
9.Extramural experiments related to analog and digital communication.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 592.1	1	2	2	2	3	2	2	3	3	2	1	1	3	2
EI 592.2	1	2	3	3	2	1	1	2	3	1	1	1	2	2
EI 592.3	1	2	3	2	1	3	3	2	1	3	2	3	2	2
EI 592.4	3	3	2	3	2	3	2	3	2	3	2	2	1	2

CONTROL ENGINEERING LABORATORY
CODE: EI 593
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3
CREDITS: 2
Prerequisite:
Use of MATLAB with SIMULINK for control system analysis and design**.**

Course Objective:
Will have a strong knowledge on MATLAB software..
They get the basic knowledge on practical control system and Design applications.
They get the knowledge of stability analysis of different control systems.

Course Outcome:
The students will be able to:

EI593.**1.**Apply the concept of transfer function for given control system problems.
EI593.**2.** Demonstrate an understanding of the fundamentals of control systems.
EI593.**3.** Analyze time response of given control system model.
EI593.**4.** Analyze the system behavior through Root Locus, Bode plots & Nyquist plot fora given control system model.

List of Experiments:
1.Familiarization with MATLAB & SIMULINK control system toolbox.
2.Study of impulse, step, ramp & sinusoidal response for first and second order system with unity feedback and calculation of parameters for different system designs.
3.Modelling of a first order system and its response analysis.
4.Modelling of a second order system and its response analysis.
5.Simulation of impulse response for types 0, 1 and 2 with unity feedback using MATLAB.
6.Determination of root-locus, using MATLAB toolbox for a given second order transfer function and analysis of result.
7.Bode plot, using MATLAB toolbox for a given second order transfer function and analysis of result.
8.Nyquist plot using MATLAB toolbox for a given second order transfer function and analysis of result.
9.Study of position control system (AC/DC).

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 593.1	2	2	3	1	2	-	-	-	-	-	-	-	2	1
EI 593.2	1	3	1	3	2	-	-	-	-	-	-	-	1	2
EI 593.3	2	2	3	1	2	-	-	-	-	-	-	-	2	2
EI 593.4	3	3	1	2	1	-	-	-	-	-	-	-	1	1

PAPER NAME: DIGITAL SIGNAL PROCESSING LAB
PAPER CODE : EI 594A
CONTACT: 3L
CREDITS: 3
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3

Course Objective:

The course aims at practical experience with the simulation and development of basic signal processing algorithms.

This imparts knowledge using standardized environments such as MATLAB and general-purpose DSP development kits.

The experiments cover fundamental concepts of digital signal processing like sampling and aliasing, internal arithmetic operations, digital filter design and implementation, signal generation.

It also delivers knowledge on different algorithms associated with filtering of long data sequences.

Course Outcome:
After completion of the laboratory course students will be able to:

EI594A.1: understand various signals generation.

EI594A.2: calculate the system output using convolution method with MATLAB Software package.

EI594A.3: analyze and Observe Magnitude and phase characteristics of different signals.

EI594A.4: determine DFT, FFT, IDFT using MATLAB.

EI594A.5: determine Magnitude and phase characteristics (Frequency response Characteristics) of digital LP,HP& FIR Butterworth filters.

EI594A.6: Develop the DSP algorithms in software using a Computer language such as C with TMS320C6713 floating point Processor.

Experiments:
1.Sampled sinusoidal signal, various sequences and different arithmetic operations using MATLAB.
2.Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.
3.Z-transform of various sequences – verification of the properties of Z-transform.
4.Twiddle factors – verification of the properties.
5.DFTs / IDFTs using matrix multiplication and also using commands.
6.Circular convolution of two sequences using graphical methods and using commands, Differentiation between linear and circular convolutions.

7.Verifications of the different algorithms associated with filtering of long data sequences and Overlap –add and Overlap-save methods.

8.Implementation of FFT of given sequence.

9.Implementation of LP & HP FIR filter for a given sequence.

10.Hardware Laboratory :

11.Writing & execution of small programs related to arithmetic operations and convolution using Assembly Language of TMS320C 5416/6713 Processor

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI594A.1	3	2	-	-	-	-	-	-	-	-	-	1	1	2
EI594A.2	1	2	-	3	-	-	-	-	-	-	-	1	1	2
EI594A.3	1	2	-	-	-	-	-	-	3	-	-	1	2	1
EI594A.4	1	2	-	-	-	-	-	-	-	3	-	1	2	1
EI594A.5	1	2	-	3	-	-	-	-	-	-	-	1	1	1
EI594A.6	2	2	-	2	-	-	-	-	1	-	-	1	1	1

PAPER NAME: RF & MICROWAVE ENGINEERING LAB
PAPER CODE: EI 594B
CONTACT: 3P
CREDITS: 2
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3

Course Objective:

To understand the function and design of the major components in a wireless transceiver: oscillator, antenna, filter, and mixer.

To analyze passive and active devices in microwave subsystems.

To provide practical analysis of transmission lines and microwave circuits, hands-on training on engineering tools.

To obtain engineering design experience through team-based design projects.

Course Outcome:

EI594B.1: Able to Define, identify and list out special type transmission line, its characteristics in microwave frequencies and concept of load.

EI594B.2: Able to recognize, memorize, categorize, arrange and implement suitably the various microwave passive devices with the utilization of engineering mathematics.

EI594B.3: Able to analyse and use the various sources of microwave energy and the characters of its operation.

EI594B.4: Able to use, compute, solve, demonstrate and apply various hardware, software tools and measuring instruments in the field of Radio Frequencies, for the betterment of communication engineering, medical science and various domestic and commercial engineering.

Experiments:

1.Measurement of unknown impedance using shift in minima technique using a waveguide test bench/ Measurement of the susceptance of an inductive and or a capacitive window using shift in minima technique using a waveguide test bench

2.Study of the characteristics of a Reflex Klystron oscillator

3.Study of Gunn-oscillator Characteristics using X-band waveguide test bench.

4.Measurement of coupling factor, Directivity, Insertion loss and Isolation of a Directional coupler using X-band waveguide test bench set up.

5.Scattering matrix of a magic tee / E-plane tee / H-plane tee using waveguide test bench at X-band.

6.Experimental/Simulation Study of filter (LPF, HPF,BPF) response.

7.Measuring of dielectric constant of a material using waveguide test bench at X-band.

8.Study of Spectrum analyzer.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
EI594B. 1	2	2	3	1	2	-	-	-	-	-	-	-	2	1
EI594B. 2	1	3	1	3	2	-	-	-	-	-	-	-	1	2
EI594B. 3	2	2	3	1	2	-	-	-	-	-	-	-	2	2
EI594B. 4	3	3	1	2	1	-	-	-	-	-	-	-	1	1

PAPER NAME: ANTENNA & PROPAGATION LAB
PAPER CODE : EI 594C
CREDITS :3
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3

Course Objective:
Determination of the fields radiated from antennas; wire antennas; array antennas; antenna radiation pattern; antenna directivity.
To learn the basic working principle of antenna
To understand the various methods involved in the measurement of antenna parameters

Course Outcome:

EI 594C.1: Basic knowledge of radiation pattern, smith chart, azimuth and elevation plane, broadside and endfire radiation
EI 594C.2: Able to define, analyze and draw the radiation pattern of dipole antenna, Half wave dipole antenna, folded-dipole antenna
EI 594C.3: Able to define, analyze and draw the radiation pattern of N-element Yagi-Uda antenna EI 594C.4: Basic understanding of performance parameter- Pyramidal Horn Antenna., Log Periodic antenna, broad side antenna array, end-fire antenna array
EI 594C.5: Able to do research and development with the utilization of engineering mathematics.

Experiments:

1.Radiation Pattern of dipole antenna.
2.To study and plot the radiation pattern of Half wave dipole antenna
3.Radiation Pattern of a folded-dipole antenna.
4.Radiation pattern of a 3-element Yagi-Uda Antenna.
5.Radiation pattern of a 4-element Yagi-Uda Antenna.
6.Radiation pattern, Gain, Directivity of a Pyramidal Horn Antenna.
7.To study and plot the radiation pattern of Log Periodic antenna
8.To study and plot the radiation pattern of broad side antenna array .
9.To study and plot the radiation pattern of end fire antenna array
10.Study of Spectrum Analyzer

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI 594C.1	2	2	3	1	2	-	-	-	-	-	-	-	2	1
EI 594C.2	1	3	1	3	2	-	-	-	-	-	-	-	1	2
EI 594C.3	2	2	3	1	2	-	-	-	-	-	-	-	2	2
EI 594C.4	3	3	1	2	1	-	-	-	-	-	-	-	1	1

PAPER NAME: Technical Skill development-II
PAPER CODE:MC581
CONTACT: 2P
CREDITS: 0
TOTAL CONTACT HOURS: 20

Prerequisite:
Microprocessor, Microcontroller & Computer Networking
Course Objective:

To introduce IOT Devices.
To acquire the basic knowledge to design & develop IOT Devices.
To Understand State of the Art – IoT Architecture.
To Understand Hardware platforms and operating systems commonly used in IoT systems.

Course Outcome:

After the completion of the course, the students will be

MC581.1: Able to understand the building blocks of IoT technology .
MC581.2: Able to understand the application areas of IOT ·
MC581.3: Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks ·
MC581.4: Able to use processors & peripherals to design & build IoT hardware.

Module I: Introduction to IoT: **[5L]**
Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models, Machine-to-Machine Communications
Module II: Network & Communication aspects **[4L]**
Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery

Module III: Developing IoTs **[6L]**
Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino. Introduction to Python programming, Introduction to Raspberry Picture, developing sensor based application through embedded system platform, Implementation of IoT with Raspberry Pi

Module IV: Data handling & Domain specific applications of IoT **[5L]**

Data Handling and Analytics, Cloud Computing, Sensor cloud, Fog computing. Applications: Smart Cities and Smart Homes, Smart Grid, Industrial Io

Text Books : 1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)

2."Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)

CO-PO-PSO mapping: (DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO Vs PO, PSO MAPPING FOR MC581

COs for Course C3	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
MC581 : 1	2	2	2	2	2	1	1	1	1	1	1	1	2	2
MC581 : 2	2	3	3	1	2	2	2	1	1	2	1	2	1	2
MC581 : 3	3	3	1	3	3	2	1	1	1	2	1	2	2	2
MC581 : 4	3	3	2	3	3	2	1	1	1	1	1	1	2	2

3rd Year ,6th Semester

A: THEORY:

Sl.	Field	Code	Subjects	Contact hours/week				Credit
				L	T	P	Total	
1	PC	EI 601	Process Control-I	3	0	0	3	3
2	PC	EI 602	Bio Medical Instrumentation	3	0	0	3	3
3	PE	EI 603A / EI 603B/ EI 603C	Power Electronics / Industrial Drives/ Advanced Sensors	3	0	0	3	3
4	PE	EI604A / EI 604B	Optoelectronics & Fibre Optic Sensors/ Soft Computing	3	0	0	3	3
5	OE	CS(EI)615A / CS(EI)615B/ CS(EI)615C	Data Structures & Algorithms / Database Management System / Software Engineering	3	0	0	3	3
Total Theory							15	15

B.PRACTICAL:

Sl.	Field	Code	Subjects	Contact hours/week				Credit
				L	T	P	Total	
1	PC	EI 691	Process Control Lab	0	0	3	3	2
2	PE	EI 693A / EI 693B/ EI 693C	Power Electronics Lab / Industrial Drives Lab/ Advanced Sensors Lab	0	0	3	3	2
3	OE	CS(EI)685A / CS(EI)685B/ CS(EI)685C	Data Structures & Algorithms Lab /Database Management System Lab / Software Engineering Lab	0	0	3	3	2
Sessional :								
4	PW	EI 681	GD & Seminar	0	0	3	3	3
5	PW	EI 682	Mini Project	0	0	3	3	3
Total practical							15	12
Total 6th semester							30	27

PROCESS CONTROL-1
CODE: EI601
CONTACT: 3L
CREDITS: 3
TOTAL CONTACT HOURS: 33

Prerequisite: Knowledge of Control Theory
Course Objective:

This course helps the student
To have a knowledge on basic process control loop & characteristics
To understand the different controller modes
To know about methods of tuning of controllers
To have a knowledge of final control element & different actuators
To apply the knowledge of Cascade, Ratio, Feed forward control to control a complex process
To provide knowledge levels needed for PLC programming and functioning.

Course Outcome:
Upon successful completion of the course students will be able to:
EI601.1: Describe different advanced control strategy
EI601.2: State the operation and use of final control element
EI601.3: Calculate controller parameters by applying different tuning methods
EI601.4 : Design a controller by applying the knowledge of different control action
EI601.5 : Write ladder logic programs and understand basics of DCS

Module I: [10]
General Review of Process, Process Control and Automation. Servo and Regulatory Control, Basic process Control loop block diagram. Characteristic parameters of a process – Process Quantity, Process Potential, Process Resistance, Process Capacitance, Process Lag, Self Regulation Characteristics and functions of different modes of control actions : Schemes and analysis of On-Off, Multistep, Floating, Time Proportional, Proportional, Integral, Derivative, PI,PD & PID control Electronic PID controller design, Pneumatic Controllers - brief analysis

Module II:[5]

Process Reaction Curves, Controllability - using (i) deviation reduction factors (ii) gain bandwidth product, State Controllability ,Tuning of Controllers: both Closed and Open loop methods (Ziegler – Nichols, Cohen – Coon, PRC method and 3-C method of parameter adjustment)

Module III:[10]
Different control strategies - schemes, brief analysis and uses

Ratio control

(ii)Cascade control

(iii)Feedforward control

(iv)Multivariable control

Final Control Element: Actuators (Pneumatic Actuators, Electrical Actuators) and Control Valves (Globe, Ball, Butterfly, Gate, Pinch), Different Parts, Fail Position, Valve characteristics, Cv, Single & Double Seated Valves, Valve sizing, Valve selection, Cavitation, Flashing, Noise

Control Valve Accessories – Air Filter Regulator, I/P Converter

Brief study of Safety Valves and Solenoid valves

Module IV:[8]

Introduction to Programmable Logic Controllers (PLCs) – Basic Architecture and Functions; Input-Output Modules and Interfacing; CPU and Memory; Relays, Timers, Counters and their uses; PLC Programming and Applications.

Introduction to DCS: overview, block diagram

Books:

1.D. Patranabis, Principles of Process Control, TMH, New Delhi, 2nd Ed.
2.D. P. Eckman, Automatic Process control, John Wiley, New York
3.Surekha Bhanot, Process Control Principal & Application, Oxford
4.B. W. Bequette, Process Control – Modeling, Design and Simulation, PHI
5.D. R. Coughanowr, Process Systems Analysis and Control, McGraw Hill
6.G. Stephanopoulos, Chemical process Control, PHI
7.C. D. Johnson, Process Control Instrumentation Technology, PHI
8.B. G. Liptak, Instrument Engineers Handbook, Chilton Book Co., Philadelphia

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
EI601.1	3	2	2	1	2	-	1	-	1	-	2	2	1	1
EI601.2	3	2	1	-	1	-	-	-	-	-	1	2	2	2
EI601.3	2	1	1	-	1	-	1	1	-	-	2	-	1	1
EI601.4	1	1	-	-	-	-	-	-	-	-	1	-	1	1
EI601.5	3	-	3	2	1	-	-	-	-	-	2	2	1	1

BIOMEDICAL INSTRUMENTATION
CODE: EI602
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 35

Prerequisite: Sensors & Transducers, Signal Processing

Course Objective:

To understand the various systems of the human physiology and signals of biological origin obtained from various systems,

To analyse various biosensors, transducers and bio-potential electrodes used to acquire various bio-potentials.

To understand various methods of measurement of blood pressure, blood flow, heart sounds and pacemaker

To familiarize with various amplifiers for measuring biopotentials.

To acquire knowledge about Electrical safety of medical devices and their protective measures.

Course Outcome:

After completion of this course, the students will be able to
EI602.1: understand the detailed physiology of various human anatomical systems.
EI602.2: identify proper transducer for acquisition of a particular bioelectric potential.
EI602.3: analyse various biological conditions from the measured bioelectric potentials.
EI602.4: design biotelemetry systems for acquiring bioelectric potentials from long distance.

Module I: Physiology of various anatomical systems: **[4L]**
Introduction to the physiology of cardiac, nervous, muscular and respiratory systems

Module II: Bioelectric potential and measuring transducers: **[8L]**
Bioelectric potentials: Definitions, types, range, basic characteristics. resting and action potential
Different types of transducers and electrodes: construction, selection for acquiring various bio-potentials

Module III: Measurements on cardiovascular and respiratory system **[11L]**
Blood pressure - characteristics of blood flow - Heart sounds - ECG - Measurement of blood pressure, blood flow, heart sounds and Cardiac pace-maker: types and its detail instrumentation.

Module IV: Electrical activities in brain and muscles: **[2L]**

Electromyography and Electroencephalograph: characteristics, measurements and signal analysis.

Module V: Medical Imaging Techniques **[4L]**

Ultrasound imaging and IR Imaging: image acquisition technique and analysis, MRI

Module VI: Biotelemetry **[3L]**
Transmission and Reception aspects of Biological signals over long distances.

Module VII: Measurement Errors and safety issues **[3L]**
Errors in bio-potential measurement, types and methods to minimize errors Electrical-Safety codes and standards, basic approaches to protection against shock, power distribution protection, equipment protection

Text Books:

1.Cromwell L – Biomedical Instrumentation and Measurement, Pearson
2.Khandpur R.S., Hand book of Biomedical Instrumentation, Tata McGraw Hill
3.Webster J S – Medical Instrumentation – Application and Design
4.Astor B R – Introduction to Biomedical Instrumentation and Measurement, McMillan.
5.Chatterjee Miller – Biomedical Instrumentation, Cengage Learning

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
EI602.1	3	2	2	2	2	-	-	-	1	-	-	1	1	2
EI602.2	3	3	2	2	2	-	1	-	-	1	-	-	1	2
EI602.3	3	3	2	3	3	1	-	1	-	-	1	-	2	1
EI602.4	3	3	3	3	3	2	2	-	1	-	-	1	2	1

POWER ELECTRONICS
CODE: EI603A
CONTACTS: 3L
CREDITS: 3
TOTAL CONTACT HOURS: 33

Prerequisite: Knowledge of analog electronics & circuit theory.

Course Objective:

To understand the constructional features and characteristic of power semiconductor devices

To understand the working principle and switching operation of different semiconductor devices.

To prepare the students to analyze and design different power converter circuits.

To implement the different power supply modules.

Course Outcome:

On completion of the course students will be able to
EI603A.1: describe the fundamental concepts and techniques used in power electronics.
EI603A.2: explain the characteristics of SCR, BJT, MOSFET and IGBT.
EI603A.3: analyze & design of various single phase and three phase power converter, inverters circuits and understand their applications.
EI603A.4: develop skills to build, and troubleshoot power electronics circuits like SMPS, Intelligent power module, etc's.

Module I: Power Semiconductor Devices & switching devices: [8L]

Rectifier diodes, fast recovery diode and Schottky barrier diode, BJT, Thyristor (SCR), TRIAC, GTO, MOSFET, IGBT and MCT.

Module II: Thyristor triggering & commutation techniques: [6L]

UJT and RC triggering circuit, resonant commutation, self commutation, auxiliary commutation, Complementary commutation.

Module III: Converters: [11L]

Rectifiers: Single phase and three phase controlled bridge rectifiers, DC to DC converters (Choppers): principle of step up and step down converters, DC to AC converters (inverters) : Single phase and three

phase inverters, Cycloconverters : Single phase to single phase and three phase to single phase circuits, blocked group operation, circulating current mode.

Module IV: Applications: **[8L]**

Modern trends in industrial drives and control; AC motor drives in transportation system and traction; induction heating, electronic ballast, UPS, Intelligent power modules.

Books:

1.P.C. Sen, Power Electronics, TMH, New Delhi

2.M. H. Rashid, Power Electronics, PHI/Pearson Education

3.C. W. Lander, Power Electronics, Mc Graw Hill

4.Mohan N, Underland T M & Robbins W P – Power Electronics, John Wiley & Sons

5.P. S. Bimbhra – Power Electronics, Khanna Publishers

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI603A.1	3	2	2	1	1	-	-	-	-	-	2	1	1	1
EI603A.2	1	2	3	-	2	-	-	-	-	-	-	-	1	1
EI603A.3	2	-	2	-	1	-	-	-	-	-	-	-	1	1
EI603A.4	-	1	-	-	3	1	-	-	-	-	-	-	1	1

INDUSTRIAL DRIVES
CODE: EI603B
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 30

Prerequisite:

Knowledge of Electrical Machines and Power Electronics.

Course Objective:

To understand the importance of different industrial drives.

To understand the working principle of different types of industrial drives.

To classify applications in different industries.

To understand the different control techniques of industrial drives.

Course Outcomes:

On completion of the course students will be able to

EI603B.1: Demonstrate the basic requirements of dc drive and ac drive.
EI603B.2: Illustrate the principles of speed-control of dc motors and ac motors.
EI603B.3: Classify the industrial applications of dc drive and ac drive.
EI603B.4**:** Apply solid state drives for speed control of various special electrical machines

Module I: AC Drives **12L**

Basic Elements of a Variable Frequency Drive (VFD) 1L
External Components in a typical Power and Control Circuit of a drive for a simple pump application 2L
Drive Control modes: Variable Frequency Control, Sensorless Vector Control, Vector Control with sensor, Flux Vector Control, Direct Torque Control 4L
Basic Specifications and Selection Procedure for AC Drives – with specific reference to Variable Torque and Constant Torque applications 3L
Use of AC Drives for energy efficient production as applied to 2L
Pumps, Fans, Compressors
Hoisting, Breaking, Lowering Conveyor Technology

Module II: DC Drives 10L
Modern DC Drives and its applications in 8L
Winders & Un-winders
Wire Drawing Machine,Bar Rolling Mill,Rotary Kiln, Basic Specifications and Selection Procedure for

DC Drives 2L

Module III:Servo Motor and Servo Drives **8L**

Block Diagram of a typical Servo Controlled System with 2L
velocity and torque feedback, velocity and position feedback,DC and AC Servomotors 2L
Selection of Servomotor for an application 2L
Fundamentals of Axis Control and its implementation 2L

Books :

1. Fundamentals of Industrial Drives, B.N. Sarkar, PHI
2. Fundamentals of Electric Drives, Gopal K Dubey, Narosa
3. Electrical Drives And Control, U.A. Bakshi, M.V.Bakshi, Technical Publications
4. Industrial Drives, Mukhtar Ahmad, MacMillan
5. Electric Drives, V Subramanyam, McGraw-Hill
6. Electric Drives, Boldea & Nasar, CRC
7. Vector Control of AC Drives, Boldea & Nasar, CRC

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
EI603B**.1**	3	1	-	-	2	-	-	-	-	-	-	2	1	1
EI603B**.2**	3	2	2	-	3	-	-	-	-	-	-	2	1	1
EI603B**.3**	3	-	-	1	2	2	-	-	-	-	1	2	1	1

ADVANCED SENSORS
CODE: EI 603C
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 30

Prerequisite: Knowledge of Sensor & Transducer; Fabrication techniques.

Course Objective:

1. To understand basics of sensors, actuators and their operating principle.
2. To educate the students on different types of microfabrication techniques for designing and developing sensors (Several applications from Electronics to Biomedical will be covered).
3. To explain working of various types of electrochemical sensors and actuators.
4. To provide information about interfacing of sensors and signal conditioning circuits to establish any control system or monitoring system.
5. To provide an understanding on characteristic parameters to evaluate sensor performance.

Course Outcome:

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

EI603C.1	Explain different techniques of sensors designing parameters.
EI603C.2	Analyze the specification of different types of sensors.
EI603C.3	Determine and compare the different micro sensor development technique.
EI603C.4	Design the micro sensors using different technique.

Module I : Sensor Signal conditioning & Reliability: **[10L]**
Design techniques of signal conditioning for different sensors

Sensor reliability, reliability models and testing, ageing tests, failure mechanisms and their evaluation, stability studies

Module II :Micro Sensor & MEMS: Introduction & Application **[10L]**

Historical Development of Microelectronics, Evolution of Micro sensors, Evolution of MEMS, Emergence of Micro machines, Sensor Systems, Sensors types and classification, Mechanical Sensors, Acoustic Sensors, Magnetic Sensors, Thermal Sensors, Optical sensors Chemical Sensors, Radiation Sensors and Biosensors. Micro sensors, Sensors based on surface-acoustic wave devices. Review Of Fabrication Techniques (Lithography, PVD,CVD ,RIE), Applications

Module III: Smart Sensors **[10L]**

Importance and Adoption of Smart Sensors, Architecture of Smart Sensors: Important components,their features, Fabrication of Sensor and Smart Sensor: Electrode fabrication: Screen printing, Photolithography,
Electroplating Sensing film deposition: Physical and chemical Vapor, Anodization, Sol- gel, Interface Electronic Circuit for Smart Sensors and Challenges for Interfacing the Smart Sensor, Usefulness of Silicon Technology in Smart Sensor and Future scope of research in smart sensor

Text Books:

1.Triethy HL - Transducers in Electronic and Meachanical Design, Mercel Dekker 1986

2.D. Patranabis – Sensor and Transducers (2e) Prentice Hall, New Delhi, 2003

3.Silicon Sensors – Middlehoek S and Audel S. A. – Academic Press, London 1989

4.Chemical Sensors – Edmonds T. E. (Ed); Blackie – London, 1988

5.Problems and possibilities of oxidic and organic semiconductor gas sensors, G. Heiland and D. Kohl, Sensors andActuators, Volume 8, Issue 3, November 1985, Pages 227-233.

6.Thick-film sensors: an overview, Maria Prudenziati and Bruno Morten, Sensors and Actuators, Volume 10, Issues 1–2,10 September 1986, Pages 65-82.

7.The use of polymer materials as sensitive elements in physical and chemical sensors, F.J. Gutierrez Monreal, Claudio M. Mari,Sensors and Actuators, Volume 12, Issue 2, August–September 1987, Pages 129-144.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
EI603C.1	3	2	3	1	-	-	3	-	-	-	1	1	1	2
EI603C.2	1	3	1	-	-	-	-	-	-	-	-	1	1	2
EI603C.3	3	-	3	-	1	-	-	-	-	-	1	-	2	1
EI603C.4	3	3	1	3	-	-	-	-	-	-	1	2	2	1

OPTOELECTRONICS AND FIBRE OPTIC SENSORS
Code: EI 604A
Contacts: 3L
Credits: 3
Total contact hours: 32

Prerequisite: Knowledge of geometrical optics and semiconductor physics

Course Objective:

To make the learners understand the different aspects of optoelectronic sources
To make the learners understand the different aspects of optoelectronic detectors
To make the learners understand the different aspects of optical fiber
To make the learners understand the application and advantages of different fiber optic sensors

Course Outcome:

After the completion of the course, learner will be able to:

EI604A.1: compare double heterojunction LED, surface emitter LED, edge emitter LED, superluminescent LED, and semiconductor based LASER (p-n junction laser, double heterojunction laser, stripe geometry) as optoelectronic sources based on working principles and applications .

EI604A.2: compare optoelectronic detectors (p-n photodiode, p-i-n photodiode, avalanche photo diode, Schottky photodiode, hetero junction diode, phototransistor, LDR, photovoltaic cells, photo emissive cells) based on detector parameters, which are responsivity, efficiency, and working principle

EI604A.3: apply the suitable optical fiber for an engineering application, based on number of modes required, distance to be covered and V-parameter

EI604A.4: justify the selection of intensity modulated fiber optic sensors, phase modulated fiber optic sensors, and spectrally modulated fiber optic sensors for engineering applications, which are measurement of temperature, pressure, displacement, and liquid level. Justify optical fiber as communication channel,

Module I: Optoelectronic sources and laser (10L)

Optoelectronics: Characteristics of optical emission, electro-luminescence, optical emission from p-n junction, direct bandgap and indirect band gap materials.

LED: spontaneous emission, power and efficiency calculation, materials of LED, structure of LED and its characteristics, double heterojunction LED, surface emitter LED, edge emitter LED, superluminescent LED.

Laser: Einstein relations, population inversion, 3- and 4-energy level systems, optical pumping, modes of laser, lasing materials-gaseous, liquid, and solid.

Semiconductor based lasers – p-n junction laser, double heterojunction laser, stripe geometry.

Holography.

Module II: Optoelectronic detectors **(8L)**

Optical detection principle, quantum efficiency, responsivity.

Photo diode: p-n photodiode, p-i-n photodiode, avalanche photo diode, Schottky photodiode, hetero junction diode, phototransistor
LDR, photovoltaic cells, photo emissive cells - types, materials, construction, response.

Opto-couplers – components, characteristics, noise figures, applications

Module III: Optical fiber and fiber optics **(8L)**

Fiber optics: Optical fiber – materials, construction, step index and graded index fibres, ray propagation. Modes in optical fibres, intermodal dispersion. Single mode and multimode fiber, attenuation and dispersion in single mode and multimode optical fibers

Active fiber,Optical fiber coupling- splices and connectors

Module IV: Fiber optic sensors **(6L)**

Fibre-optic sensors: advantages, intrinsic and extrinsic sensors

Classification- intensity modulated sensors, phase modulated sensors, spectrally modulated sensors.

Fibre optic sensors for Industrial applications: temperature, displacement, pressure and liquid-level sensors.

Fiber optic interferometer- Mach –Zahnder interferometer, Sagnac interferometer

Books:

1.Bhattacharjee, *Semiconductor Optoelectronic Devices*, PHI

2.John Wilson and John Hawkes, *Optoelectronics- An Introduction*, PHI

3.John M. Senior, *Optical Fibre Communications*, PHI

4.R.P. Khare, *Fiber Optics and Optoelectronics*, Oxford University Press

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI604A.1	3	-	3	-	-	-	-	-	-	-	2	-	2	2
EI604A.2	3	-	3	-	-	-	-	-	-	-	2	-	2	2
EI604A.3	3	-	-	-	-	-	2	-	-	-	-	2	2	2
EI604A.4	3	-	3	-	3	-	-	-	-	-	2	2	2	2

SOFT COMPUTING
Code: EI 604B
Contacts: 3L
Credits: 3
Total contact hours: 30

Prerequisite: Knowledge of set theory, nervous system, and biological evolution

Course Objective:

To make the learners understand the advantages of soft computing techniques

To make the learners understand the different aspects of fuzzy logic and fuzzy reasoning

To make the learners understand the different aspects of artificial neural networks

To make the learners understand the different aspects of genetic algorithm

Course Outcome:

After the completion of the course, learner will be able to:

EI604B.1: explain the use of fuzzy logic for decision making in presence of uncertainty

EI604B.2: explain a fuzzy logic control system for a continuous-time plant with single i/p-single o/p

EI604B.3: analyze the operation of genetic algorithm based optimization technique

EI604B.4: compare the supervised and unsupervised learning techniques in artificial neural networks

Module I: Soft Computing and Fuzzy logic **(8L)**

Soft-computing-definition, advantage over conventional computing, areas of application, Fuzzy Sets, membership function and membership value, linguistic variable, Fuzzy operators, T- Norms and S- Norms, Fuzzy relations, implications, cylindrical extensions, projection, Fuzzification and defuzzification

Module II: Fuzzy reasoning and fuzzy logic control **(10L)**

Fuzzy extension principle, compositional rule of inference, approximate reasoning (fuzzy reasoning)
Different Fuzzy models-Mamdani's model, Sugeno's model (T-S-K model)
Fuzzy logic control system, fuzzy PID controller

Module III: Genetic algorithm **(4L)**

Genetic Algorithm (GA)- basic concept, components-chromosome and gene, GA operators, methods of selection, elitism, Fuzzy-GA system

Module IV: Artificial neural networks **(8L)**

Artificial neural network (ANN)- basic concept, areas of application, McCulloch and Pitts model, perceptron, realization of logic gates, training of ANN, Supervised and unsupervised learning-techniques and comparison, Neuro-fuzzy system

Books:

1.D.Dirankov, H. Hellendoorn, and M.Reinfrank, An Introduction to Fuzzy logic control, Narosa

2.S.Rajasekaran and G.A.V. Pai, Neural Networks, Fuzzy logic and Genetic Algorithm: Synthesys and Applications, Pearson Education

3.J.S.R.Jang, C.T. Sun and, E.Mizutani, Neuro-fuzzy and soft Computing, Pearson Education

4.T.J.Ross, Fuzzy Logic with Engineering Applications, Wiley (India)

5.B.Yegnanarayana, Artificial Neural Networks, PHI

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI604B. 1	3	-	2	-	-	-	-	-	-	-	-	2	2	1
EI604B.2	3	-	3	-	3	-	-	-	-	-	-	2	1	2
EI604B.3	3	-	1	2	-	-	-	-	-	-	-	2	1	2
EI604B.4	3	-	1	2	-	-	-	-	-	-	-	2	2	1

DATA STRUCTURES & ALGORITHMS
CODE: CS(EI) 615A
CONTACT : 3
CREDIT : 3
NO. OF LECTURES: 36 HOURS

Prerequisite:

Familiarity with the fundamentals of C or other programming language.
A solid background in mathematics, including probability, set theory.

Course Objective:

To learn the basics of abstract data types.

To learn the principles of linear and nonlinear data structures.

To build an application using different data structures.

Course Outcome:

On completion of the course students will be able to

CS(EI) 615A.1: Explain how the choices of data structure & algorithm methods impact the performance of program.

CS(EI) 615A.2: Solve problems based upon different data structure & also write programs.

CS(EI) 615A.3: Identify appropriate data structure & algorithmic methods in solving problem.

CS(EI) 615A.4: Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

CS(EI) 615A.5: Compare and contrast the benefits of dynamic and static data structures implementations.

Module I: Linear Data Structure [10L]

Introduction (2L):

Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data

Type. Algorithms and programs, basic idea of pseudo-code **(1L)**

Algorithm efficiency and analysis, time and space analysis of algorithms – order notations **(1L)**

Array (2L):

Different representations – row major, column major **(1L)**

Sparse matrix - its implementation and usage, Array representation of polynomials **(1L)**

Linked List (6L):

Singly linked list – operations, Doubly linked list – operations **(4L)**

Circular linked list – operations, Linked list representation of polynomial and applications **(2L)**

Module II: Linear Data Structure [6L]

Stack and Queue (4L):

Stack and its implementations (using array and linked list) **(1L)**

Applications (infix to Postfix, Postfix Evaluation) **(1L)**

Queue, circular queue, de-queue **(1L)**

Implementation of queue- linear and circular (using array and linked list) **(1L)**

Recursion (2L):

Principles of recursion - use of stack, tail recursion. **(1L)**

Applications - The Tower of Hanoi, Eight Queens Puzzle **(1L)**

Module III: Nonlinear Data structures [12L]

Trees (8L):

Basic terminologies, forest, tree representation (using array and linked list) **(1L)**

Binary trees - binary tree traversal (pre-, in-, post- order) **(1L)**

Threaded binary tree **(1L)**

Binary search tree- operations (creation, insertion, deletion, searching) **(1L)**

Concept of Max-Heap and Min-Heap **(**creation, deletion) **(1L)**

Height balanced binary tree – AVL tree (insertion with examples only) **(1L)**

Height balanced binary tree – AVL tree (deletion with examples only) **(1L)**

m –Way Search Tree, B^+ Tree – operations (insertion, deletion with examples only) **(1L)**

Graphs (4L):

Graph theory review **(1L)**

Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) - concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge) **(2L)**

Minimal spanning tree – Prim's algorithm, Kruskal's algorithm (basic idea of greedy methods) **(1L)**

Module IV: Searching, Sorting [8L]

Sorting Algorithms (4L):

Bubble sort, Insertion sort, Selection sort – with notion of complexity **(1L)**
Quick sort, Merge sort – with complexity **(2L)**
Radix sort – with complexity **(1L)**
Searching (2L):
Sequential search – with complexity **(1L)**
Binary search, Interpolation Search– with complexity **(1L)**
Hashing (2L):
Introduction to Hashing and Hashing functions **(1L)**
Collision resolution techniques **(1L)**
Recommended books:
1."Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung
2."Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed
3."Data Structures in C" by Aaron M. Tenenbaum
4."Data Structures" by S. Lipschutz
5."Data Structures Using C" by Reema Thareja
6."Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS(EI) 615A.1	3	3	2	2	3	2	2	3	3	3	2	3	3	3
CS(EI) 615A.2	3	2	2	2	2	2	3	2	2	3	3	2	3	3
CS(EI) 615A.3	3	3	3	2	3	3	3	2	2	3	3	2	3	3
CS(EI) 615A.4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CS(EI) 615A.5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

DATABASE MANAGEMENT SYSTEM
CODE: CS(EI)615B
CONTACT: 3L
CREDITS: 3
Total Contact Hours:34

Prerequisite:

An understanding of basic computer software
Object Oriented programming skills.

Course Objective:

To develop basic Knowledge in Software Engineering and its applications.

To understand software Engineering layered architecture and the process frame work.

To analize software process models such as the waterfall, spiral, evolutionary models and agile method for software development.

To design software requirements and specifications of documents.

To understand project planning, scheduling, cost estimation, risk management.

To describe data models, object models, context models and behavioral models.

To learn coding style and testing issues.

To know about the quality checking mechanism for software process and product.

Course Outcome:

On completion of the course students will be able to

CS(EI) 615B.1: Apply the knowledge of Entity Relationship (E-R)diagram for an application.
CS(EI) 615B.2: Create a normalized relational database model
CS(EI) 615B.3: Analyze real world queries to generate reports from it.
CS(EI) 615B.4: Determine whether the transaction satisfies the ACID properties.
CS(EI) 615B.5: Create and maintain the database of an organization.

ModuleI (6L)

SoftwareEngineering–Characteristics,Components,Application,Definitions,SoftwareProcessmodels-WaterfallModel,Prototypemodel,RAD,EvolutionaryModels,Incremental,Spiral.,SoftwareProjectPlanning-

FeasibilityAnalysis,TechnicalFeasibility,Cost-BenefitAnalysis,Basics of estimation : COCOMO (Basic, intermediate, Complete) model

ModuleII (6L)

SystemAnalysis:PrincipleofStructureAnalysis,RequirementAnalysis,DFD,EntityRelationship Diagram,DataDictionary,DataModeling,SoftwareRequirementsSpecification

SoftwareDesignAspects:Objectives,Principles,Concepts,HLD and LLD, Top-DownandBottom-Updesign;

Decision tree,decisiontableandstructuredEnglish,Structurechart,TransformanalysisFunctional Vs.Object-Orientedapproach.

ModuleIII (3L)

Introduction to Agile Methodology ,Agile Testing , Quality in agile software development

ModuleIV (4L)

UnifiedModelingLanguage:
Classdiagram,interactiondiagram:collaborationdiagram,sequencediagram,statechartdiagram,activity, diagram,implementationdiagram, Use Case diagram

ModuleV (10L)

Coding&Documentation–StructuredProgramming,ModularProgramming,ModuleRelationship-Coupling,Cohesion,OOProgramming,InformationHiding,Reuse,SystemDocumentation.

Testing–LevelsofTesting,IntegrationTesting,SystemTesting**.**

TestCases-WhiteBoxandBlackBoxtestingSoftwareQuality,QualityAssurance,SoftwareMaintenance, SoftwareConfigurationManagement,SoftwareArchitecture.

ModuleVI (5L)

Software Project Management – Project Scheduling, Staffing, Quality Assurance, Risk Management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement Project Monitoring.

Text Book

1. Software Engineering: Apractitioner’s approach–Pressman(TMH)

Reference Books:

1.SoftwareEngineering-PankajJalote(Wiley-India)

2.SoftwareEngineering-RajibMall(PHI)

3.SoftwareEngineering–Agarwal and Agarwal(PHI)

4.“Database Management Systems”, ArunK.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS(EI) 615B.1	2	2	2	2	3	2	1	1	2	2	3	3	3	3
CS(EI) 615B.2	2	3	3	3	3	1	1	1	2	2	3	3	3	3
CS(EI) 615B.3	3	3	2	3	3	2	2	2	3	3	3	3	3	3
CS(EI) 615B.4	3	3	2	2	2	1	1	1	1	1	2	3	3	3
CS(EI) 615B.5	3	3	3	3	3	2	2	2	3	3	3	3	3	3

SOFTWARE ENGINEERING
CODE: CS (EI) 615C
CONTACT: 3L
CREDIT: 3
TOTAL CONTACT HOURS: 36

Prerequisite:

An understanding of basic computer software
Object Oriented programming skills.

Course Objective:

To understand the working environment in industry and aware of cultural diversity, who conduct themselves ethically and professionally.

Graduates use effective communication skills and technical skills to assure production of quality software, on time and within budget.

Graduates build upon and adapt knowledge of science, mathematics, and engineering to take on more expansive tasks that require an increased level of self-reliance, technical expertise, and leadership.

Course Outcome:

On completion of the course students will be able to

CS(EI)615C.1: identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
CS (EI)615C.2: analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project
CS (EI)615C.3: design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns.
CS (EI)615C.4: develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.
CS (EI)615C.5: integrate the modern engineering tools necessary for software project management, time management and software reuse, and an ability to engage in life-long learning.

Module I

Software Engineering –Characteristics, Components, Application, Definitions, Software Process models - Waterfall Model, Prototype model, RAD, Evolutionary Models, Incremental, Spiral. Agile Method

Software Project Planning- Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO (Basic, intermediate, Complete) model, (**6L)**

Module II

System Analysis: Principle of Structure Analysis, Requirement Analysis, DFD, Entity Relationship Diagram, Data Dictionary, Data Modeling, Software Requirements Specification **(3L)**

Module III

Software Design Aspects: Objectives, Principles, Concepts, Top-Down and Bottom-Up design; Decision tree, decision table and structured English, Structure chart, Transform analysis Functional Vs. Object-Oriented approach. **[3L]**

Module IV

Unified Modeling Language: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity, diagram, implementation diagram, Use Case diagram **(4L)**

Module V

Coding & Documentation – Structured Programming, Modular Programming, Module Relationship-Coupling, Cohesion, OO Programming, Information Hiding, Reuse, System Documentation. **[4L]**
Testing – Levels of Testing, Integration Testing, System Testing.**[4L]**
Test Cases- White Box and Black Box testing Software Quality, Quality Assurance, Software Maintenance, Software Configuration Management, Software Architecture. **[6L]**

Module VI
Software Project Management – Project Scheduling, Staffing, Quality Assurance, Risk Management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement Project Monitoring. **[6L]**

Reference Books:

1.Software Engineering : A practitioner's approach– Pressman(TMH)
2.Software Engineering- Pankaj Jalote (Wiley-India)
3.Software Engineering- Rajib Mall (PHI)
4.Software Engineering –Agarwal and Agarwal (PHI)

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS(EI)615C.1	1	1	2	2	1	-	-	-	-	-	-	-	1	1
CS(EI)615C.2	2	2	1	-	-	-	-	-	-	1	-	-	1	1
CS(EI)615C.3	-	-	-	-	-	2	-	1	-	2	-	-	2	1
CS(EI)615C.4	-	-	-	-	-	-	-		3	-	1	2	2	1
CS(EI)615C.5	-	-	-	-	-	-	-		2	1	2	2	1	1

PROCESS CONTROL LAB
CODE: EI691
CONTACT: 3P
CREDITS: 2

COURSE OUTCOME:

After completion of the laboratory course students will be able to:

After completion of the laboratory course students will be able to:
EI691.1: Recognize & explain basic process control loop elements via hands on experiment.
EI691.2: explain different process variable (flow, pressure, level & temperature) using different controller mode.
EI691.3: apply various PLC functions and develop PLC programs to control a real time system.
EI691.4: explain the Control & monitor different process variable through DCS.
.

Experiments :

1.Study of Flow, Level, Pressure, Temperature processes and construction of the P&I diagrams in accordance with ISA guidelines / standards
2.Study of a Temperature Control Loop having Furnace, suitable final control element, Temperature transmitter, conventional PID controller/Control System, and data logger/recorder
3.Study of a Pressure Control Loop having Pressure source, Pressure Transmitter, Motorized/Pneumatic control valve, and conventional PID controller/Control System
4.Study of a Flow Control Loop having suitable Flow meter, Motorized/ Pneumatic control valve, and conventional PID controller/Control System
5.Study of a Level Control Loop having Level Transmitter, Motorized/ Pneumatic control valve, and conventional PID controller/Control System
5.Study of a typical Air Duct Flow Monitoring and Control
6. PLC Programming
7.Study of a PC based Automation Software / Simulation Software
8.Configuring the DCS for Temp./Flow/Pressure processes.
9.Extra Mural Experiment

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
EI691.1	2	2	1	-	-	-	-	-	-	-	-	-	1	1
EI691.2	2	2	1	1	2	-	-	-	2	-	-	-	1	1
EI691.3	2	3	3	3	3	1	-	-	1	-	-	-	1	1
EI691.4	1	2	2	-	-	-	-	-	1	-	-	-	1	1

POWER ELECTRONICS LABORATORY
Code : EI 693A
Contacts : 3P
Credits : 2

Course Outcome:

At the end of the course, a student will be able to:

EI693A.**1 :** Identify relevant information to supplement to the Power Electronics course & set up testing strategies and select proper instruments to evaluate performance characteristics of Power devices and power electronics circuits and analyze their operation under different loading conditions.
EI693A.**2:** Realize the limitations of computer simulations for verification of circuit behavior, apply these techniques to different power electronic circuits and evaluate possible causes of discrepancy in practical experimental observations in comparison to theory.
EI693A.**3:** compute the results, incorporating accepted data analysis and synthesis methods, mathematical software,and word-processing tools.
EI693A.**4:** demonstrate the ability to interact effectively on a social and interpersonal level with fellow students, and will demonstrate the ability to divide up and share task responsibilities to complete assignments.

Experiments:

1.Study of Characteristics of an SCR and a TRIAC.
2.Study of Diode-Resistance, Diode-Resistance-Capacitance, Resistance-Capacitance and UJT Triggering Circuits for SCR.
3.Study of the operation of a single phase fully controlled bridge converter supplying R-L load and freewheeling diode, including generation of triggering pulses for the devices for both continuous and discontinuous modes of conduction.
4.Study of a self commutation circuit for commutating an SCR operating on a DC supply.
5.Simulation of DC to DC step down chopper.
6.Simulation of PWM bridge inverter using MOSFET/IGBT with R/R-L load.
7.Simulation of Single phase AC regulator.
8.Study of a control circuit for a stepper motor and its operation./ Study of a single quadrant chopper controlled PM dc motor.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
EI693A.1	2	1	1	1	-	-	-	-	-	-	2	1	1	1
EI693A.2	1	2	1	1	-	1	1	-	-	-	-	1	1	1
EI693A.3	1	2	1	1	2	-	-	-	-	-	-	1	1	1
EI693A.4	1	-	-	-	2	1	1	-	-	-	1	-	1	1

INDUSTRIAL DRIVES LABORATORY
CODE: EI693B
CONTACTS: 3P
CREDIT: 2

Course Outcomes:
At the end of this course, students will be able to:

EI693B.1: understand the concept of different electrical drives by performing simulation and appreciate the result based on analysis.
EI693B.2: conduct different hardware experiments on dc motor drive as well as on ac motor drive.
EI693B.3: implement their own ideas for controlling the speed as well as other relevant parameters of different motors using PLC.
EI693B.4: design any kind of electrical drive suitable for different industrial problems.

Experiments:

1.Study of the characteristics of a DC motor
2.Study of methods of speed control of DC motor
3.Measurement of speed of DC series motor as a function of load torque.
4.Polarity test on a single phase transformer & study of different connections of three phase transformer.
Study of performance of three phase squirrel- cage Induction motor – determination of iron-loss, friction & windage loss.
5.Different methods of starting of a 3 phase Cage Induction Motor & their comparison [DOL, Auto transformer & Star-Delta].
6.Speed control of 3 phase squirrel cage induction motor by different methods & their comparison [voltage control & frequency control].
7.Speed control of 3 phase slip ring Induction motor by rotor resistance control. Load test on single phase Induction motor to obtain the per
8.Load test on wound rotor Induction motor to obtain the performance characteristics. formance characteristics.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
EI693 B.1	3	3	2	-	2	-	-	-	-	-	2	2	1	1
EI693 B.2	3	3	2	-	1	-	-	-	-	-	3	2	1	1
EI693 B.3	3	3	2	-	1	-	-	-	-	-	2	2	1	1

ADVANCED SENSORS LABORATORY
CODE: EI 693C
CONTACT: 3P
CREDITS: 2

Course Outcome:
At the end of this course, students will be able to:

EI693C.1: Able to experiment with the different techniques of sensors fabrication.
EI683C.2: Able to demonstrate the characteristics of different types of smart sensors.
EI693C.3: Able to analyze and compare the different micro sensor development technique.
EI693C.4: Able to estimate the different sensors parameters such that this knowledge can be used for sensors development.
EI693C.5: Able to design the smart sensors and IC based sensors.

List of Experiments:

1.Study of fabrication procedure for sensor.

2.To study and find characteristics of any chemical sensor.

3.To study of different materials used for micro sensors.

4.Design of smart sensor and its signal conditioning.

5.Study of gas sensors and its industrial applications.

6.Design of application for any IC sensors.

7.Implementation of fibre optic sensor application.

8.Implementation of gas sensor application.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
EI693C.1	3	3	2	-	-	-	-	-	-	-	2	2	2	2
EI683C.2	3	3	2	-	-	-	-	-	-	-	2	2	2	2
EI693C.3	3	2	1	-	-	-	-	-	-	-	1	2	2	2
EI693C.4	2	3	1	-	-	-	-	-	-	-	2	2	2	2
EI693C.5	3	2	2	-	-	-	-	-	-	-	1	1	1	1

DATA STRUCTURES & ALGORITHMS LAB
CODE: CS(EI) 685A
CONTACT : 3P
CREDIT POINT: 2

Course Outcome:

The students will be able to:
CS(EI) 685A.1: Choose appropriate data structure as applied to specified problem definition.
CS(EI) 685A.2: Describe the operations like searching, insertion, deletion, traversing mechanism on various data structures.
CS(EI) 685A.3: apply practical knowledge on the applications of data structures.
CS(EI) 685A.4: analyze, store, manipulate and arrange data in an efficient manner.
CS(EI) 685A.5: implement queue and stack using arrays and linked list. Implementation of queue, binary tree and binary search tree.

Module 1

Write a C program that uses functions to perform the following:

Create a singly linked list of integers.

Delete a given integer from the above linked list.

Display the contents of the above list after deletion.

Write a C program that uses functions to perform the following:

Create a doubly linked list of integers.

Delete a given integer from the above doubly linked list.

Display the contents of the above list after deletion.

Write a C program to implement Polynomial addition and Polynomial multiplication using Linked List.

Write a C program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.

Write C programs to implement a queue ADT using i) array and ii) doubly linked list respectively.

Module 2

Write a C program that uses functions to perform the following:

Create a binary search tree of characters.

Traverse the above Binary search tree recursively in Postorder.

Write a C program that uses functions to perform the following:

Create a binary search tree of integers.

Traverse the above Binary search tree non recursively in inorder.

Module 3

Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:

Insertion sort

Merge sort

Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:

Quick sort

Selection sort

Write C programs for implementing the following searching methods:

Linear Search
Binary Search

Write a C program to implement all the functions of a dictionary (ADT) using hashing.

Module 4

Write C programs for implementing the following graph traversal algorithms:

Depth first search

Breadth first search

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CS(EI) 685A. 1	3	3	2	2	2	2	1	1	-	1	-	-	2	3
CS(EI) 685A..2	3	2	2	-	2	2	1	-	-	1	-	2	2	2
CS(EI) 685A.3	2	1	1	-	-	-	-	1	-	-	-	-	2	2
CS(EI) 685A.4	3	2	-	2	-	1	1		1	-	1	-	2	2
CS(EI) 685A.5	1	-	2	1	2	-	-	1	1	-	1	2	2	1

DATABASE MANAGEMENT SYSTEM LAB
CODE:CS(EI)685B
CONTACT: 3P
CREDITS: 2

Course Outcome(s)

On completion of the course students will be able to

CS(EI)685B.1: Understand the basic concepts regarding database, know about query processing and techniques involved in query optimization and understand the concepts of database transaction and related database facilities including concurrency control, backup and recovery.

CS(EI)685B.2: Understand the introductory concepts of some advanced topics in data management like distributed databases, data warehousing, deductive databases and be aware of some advanced databases like partial multimedia and mobile databases.

CS(EI)685B.3: Differentiate between DBMS and advanced DBMS and use of advanced database concepts and become proficient in creating database queries.

CS(EI)685B.4: Analyze database system concepts and apply normalization to the database.

CS(EI)685B.5: Apply and create different transaction processing and concurrency control applications.

Course Contents:

Structured Query Language
Module1: [6L]
Creating Database
Creating a Database
Creating a Table Specifying Relational Data Types
Specifying Constraints Creating Indexes

Module2: [3L]
Table and Record Handling
INSERT statement
Using SELECT and INSERT together
DELETE, UPDATE, TRUNCATE statements
DROP, ALTER statements
Module3: [6L]
Retrieving Data from a Database
The SELECT statement
Using the WHERE clause
Using Logical Operators in the WHERE clause
Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause Using Aggregate Functions
Combining Tables Using JOINS
Sub-queries
Module 4: [3L]
Database Management

Creating Views
Creating Column Aliases
Creating Database Users
Using GRANT and REVOKE
Module 5:[6L]
PL/SQL
Module 6:[6L]
Database design using E-R model and Normalization
Module 7:[6L]
Design and implementation of some on line system [Library Management System]

Text Books:

1.SQL, PL/SQL by Ivan Bayross, BPB Publications
2.Oracle PL/SQL Programming, 6th Edition - O'Reilly Media By Steven Feuerstein, Bill Pribyl

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CS(EI) 685B.1	2	2	2	2	3	2	1	1	2	2	3	3	3	3
CS(EI) 685B.2	2	3	3	3	3	1	1	1	2	2	3	3	3	3
CS(EI) 685B.3	3	3	2	3	3	2	2	2	3	3	3	3	3	3

SOFTWARE ENGINEERING LAB
PAPER CODE: CS(EI)685C
CONTACT :3P
CREDIT POINT: 2

Course Outcomes:
On completion of the course students will be able to

CS(EI)685C.1 To handle software development models through rational method.
CS(EI)685C.2 To prepare SRS document, design document, test cases and software configuration management and risk management related document.
CS(EI)685C.3 To Develop function oriented and object oriented software design using tools like rational rose.
CS(EI)685C.4 To perform unit testing and integration testing **CS(EI)685C.5** To apply various white box and black box testing techniques

Assignments to be given from the following
1. Preparation of requirement document for standard application problems in standard format. (e.g. Library Management System, Railway Reservation system, Hospital management System, University Admission system) .DFD of standard application problems.
2. Project Schedule preparation. Software Requirement Analysis: Describe the individual Phases/ modules of the project, Identify deliverables.
3. Use Case diagram, Class Diagram, Sequence Diagram, Activity Diagram and prepare Software Design Document using tools like Rational Rose.(For standard application problems)
4. Software Development and Debugging. Estimation of project size using Function Point(FP) for calculation.
5. Design Test Script/Test Plan(both Black box and White Box approach)
6. Compute Process and Product Metrics (e.g Defect Density, Defect Age, Productivity, Cost etc.) Cost Estimation models. COCOMO
7.Innovative Experiment

Text Book:
1. Software Engineering: A practitioner's approach–Pressman(TMH)
Reference Book:
1. Software Engineering-Pankaj Jalote (Wiley-India)

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS(EI) 685C.1	3	3	3	2	2	-	-	-	-	-	-	3	3	2
CS(EI) 685C.2	3	2	3	-		-	-	-	-	-	-	2	3	2
CS(EI) 685C.3	3	2	3	2	3	-	-	-	-	-	-	-	3	2
CS(EI) 685C.4	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CS(EI) 685C.5	3	2	-	-	-	-	-	-	-	-	-	2	3	3

4th Year,7th Semester

A.THEORY:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	HS	HU702	Values & Ethics in Profession	2	0	0	2	2
2	PC	EI 701	Telemetry and Remote Control	3	0	0	3	3
3	PC	EI 702	Process Control-II	3	0	0	3	3
4	PE	EI703A/ EI703B/ EI703C	Digital Image Processing/ Non-Conventional Energy Sources/ Analytical Instrumentation	3	0	0	3	3
5	OE	CS(EI)714A / CS(EI)714B /CS(EI)714C	Computer Networking/ Computer graphics and Multimedia /Object Oriented Programming	3	0	0	3	3
Total Theory							14	14

B. PRACTICAL & SESSIONAL:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	PC	EI 791	Telemetry and Remote Control Lab	0	0	3	3	2
2	OE	CS(EI)784A / CS(EI)784B / CS(EI)784C	Computer Networking Lab/ Computer graphics and Multimedia Lab / Object Oriented Programming Lab	0	0	3	3	2
3	PW	EI 793	Project-1	0	0	6	6	2
Sessional								
4	PW	EI 781	Industrial Training Evaluation	4 wks during 6th -7th Sem-break				2
5	MC	MC781	Foreign Language	2	0	0	2	0
Total practical and sessional							14	8
Total 7th Semester							28	22

VALUES AND ETHICS IN PROFESSION

PAPER CODE: HU702

TOTAL CONTACT HOURS: 24

CREDIT: 2

Pre requisites: Basic knowledge of management, basics of communication, Knowledge about environment science

Course Objective: To create awareness on professional ethics and Human Values

Course Outcome:
On Completion of this course student will be able to :

HU702.1: Understandthecorevaluesthatshapetheethicalbehaviourofanengineerand Exposedawareness on professional ethics and human values.

HU702.2: Understand the basic perception of profession,professionalethics,andvariousmoral issues

HU702.3: Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field

HU702.4: Explain responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.

HU702.5: Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives

Module: 1. Introduction: Definition of Ethics; Approaches to Ethics:

Psychological, Philosophical, Social.

Module: 2. **Psycho-social theories of moral development**: View of Kohlberg;

Morality and Ideology, Culture and Morality, Morality in everyday

Context.

Module: 3. **Ethical Concerns**: Work Ethics and Work Values, Business Ethics,

Human values in organizations: Values Crisis in contemporary society

Nature of values: Value Spectrum of a good life.

Module: 4. Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals.

Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Module: 5. **Self Development**: Character strengths and virtues, Emotional

Intelligence, Social intelligence, Positive cognitive states and processes

(Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

Module: 6.Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics

Appropriate Technology, Movement of Schumacher; Problems of man, machine, interaction.

Text / Reference Books:

1.Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994

(2nd Ed)

2.Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

3.A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO 3	PO4	PO5	PO 6	PO 7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO2
HU702.1	-		-	-	-	1	1	1	1	2	-	-	1	1
HU702.2	-	-	-	-	-	1	1	3	1	2	-	-	1	1
HU702.3	-	-	-	-	-	3	2	3	-	1	-	-	1	1
HU702.4	-	-	-	-	-	3	2	1	-	-	-	-	1	1
HU702.5	-	-	-	-	-	3	2	2	-	1	3	-	1	1

Telemetry & Remote Control
Code: EI701
Contact: 3P
Credits: 3
Total contact hours: 31
Prerequisite:

To understand this course, the learner must have ideas of Laplace transformation & Fourier transformation, digital and analog electronics, digital and analog communication, Fiber Optics, Modulation and Multiplexing techniques

Course Objective:

To understand the concepts of telemetry system
To understand the concepts remote sensing,
To enable selection and design of remote sensing and telemetry systems

Course Outcome:
Students will be able to

EI701.1**:** Understand the concepts and purpose of different Telemetry &Remote control systems in Instrumentation field Identify the concepts and utilities of telemetry systems

EI701.2**:** Recognize the various Telemetry systems, coding, modulation techniques and Time Division Multiplexing and Frequency Division Multiplexing techniques and MODEM and concept of Wave propagation

EI701.3**:** Understand the concepts and applications of atellite Telemetry

EI701.4**:** Design and implement the Remote control system for various Industrial application purposes and the guidelines for solving different industry related complex problems

Module I

Basic Concept: Telemetry:-its purpose and application potential, basic schemes-pneumatic, current, voltage, frequency; wired and wireless types. Concepts of Information transfer, Noise and its distribution; Probability function. Bit error rate 5

Module II

Different Multiplexing & De multiplexing techniques: FDM and TDM ,CDM , WDM Multiple accessing techniques: TDMA,FDMA , CDMA ,WDMA
TDM Systems: their circuits, scanning techniques; TDM-PAM, PAM-PM Systems, Synchronization, TDM-PCM System 5

Modem Protocols, Modems & Modem protocols, Synchronous protocols.
Wave Propagation: Aspects of wave propagation; Space and Surface waves 5

Module III 9

Satellite Communication: Basic concepts of Satellite Communications, Communication Networks and Services, Comparison of Network Transmission technologies, Orbital and Spacecraft problems, Growth of Satellite communications, TT and C services, subsystems, The earth station, Multiple access, Single Access, Pre-assigned FDMA, Demand Assigned FDMA, TDMA, Pre-assigned TDMA, Demand-assigned TDMA, Satellite-Switched TDMA, Code Division Multiple Access, GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System, Direct Broadcast Satellites (DBS)- Direct To Home Broadcast (DTH), Digital Audio Broadcast (DAB)

Module IV 6

Remote Control: Communication based processing control system, pipelines, operational security systems components, pipeline control, power system control

Reference Books:

1.D. Patranabis, Telemetry principles, TMH, New Delhi

2. E. L. Gruenberg, Handbook of Telemetry and Remote control, Mc Graw Hill

3.Modern Digital and Analog Communication Systems - B. P. Lathi, Oxford University Press

4.Swobada G – Telecontrol Method and Application of Telemetering and Remote Control, Von Nostrand, 1971

5. Lillesand, M.T. and Ralph, W., Remote Sensing and Image Interpreation, John Wiley (2004) 6th ed

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
EI701.1	1	2	2	2	1	1	-	1	-	1	1	1	1	1
EI701.2	1	1	1	3	-	1	1	-	1	1	-	-1	1	1
EI701.3	1	2	-	1	2	-	1	1	-	-	2	2	1	1
EI701.4	1	2	2	3	-	1	-	1	1	1	2	1	1	1

Process Control- II

Code: EI 702
Contacts: 3L
Credits: 3
Total contact hours: 32

Prerequisite: Knowledge of continuous time control system, process control, fuzzy logic (preferred)

Course Objective:

To make the learners understand discretization and reconstruction of signals
To make the learners understand z-transform and inverse z-transform
To make the learners understand the different aspects of discrete-time control system including stability analysis, modeling and time-response analysis
To make the learners understand the techniques to design digital controller
To make learners understand the advantage of DCS in process control and the functions of different parts of DCS
To introduce the learner to fuzzy logic control

Course Outcome:

After the completion of the course, learner will be able to:

EI702.1: describe the discretization and reconstruction of a given signal by using ideal sampler and zero order hold, respectively
EI702.2: explain the z-transform and inverse z-transform for given functions
EI702.3: compute mathematical modelling, stability analysis and time response analysis of a linear time-invariant discrete-time control system
EI702.4: compare the fuzzy logic control system with a conventional control system
EI702.5: analyse the functionality of DCS in a process plant, including control, communication, protocols and network topology
EI702.6: design digital PID controller and deadbeat controller for linear time-invariant single i/p-single o/p system

Module I: Signal discretization, signal reconstruction, z-transform (10L)

Digital control system with continuous process and digital controller,

advantages & limitations of digital control system

Signal discretization - Sampling of continuous signal, sampling as impulse modulation, sampled spectra & aliasing, sampling theorem

Signal reconstruction – zero order hold and first order hold

Mapping between s-plane and z-plane.

z-transform- advantage of z-transform, z-transform of discrete-time signals, z-transform theorems, modified z-transform, inverse z-transform, limitations of z-transform

Representation of digital control system – Linear Difference Equations, Pulse Transfer Function.

Analysis of a discrete-time single input-single output system by Z-transform techniques

Stability studies for discrete-time control systems – Jury's stability criteria

w - plane transforms for discrete-time systems

Module II: Digital controllers **(4L)**

Designing a digital controller, physical realizability

Digital control algorithms :-

Digital PID controller
Dead beat control
Dahlin's algorithm

Module III: DCS **(12L)**

DCS – basic components and their functions.
HMI – operator & engineering interface, functions and requirements.
Communication – ISO/OSI reference model ; data highway and Fieldbus ;
HART Network access protocols – TDMA, CSMA/CD, token passing, Master – Slave Transmission media – twisted pair, co-axial, optical fiber ; Network topology – mesh, ring, star, bus ;
Redundancy – processor, bus and input-output level

Module IV: Fuzzy logic control **(4L)**

Fuzzy logic control –fuzzy set, membership function, linguistic variable, fuzzy operators, fuzzy reasoning, defuzzification, Mamdani's model, Sugeno's model

Module V: Case studies **(2L)**

Case studies- rolling mill control (system with time delay), pH control (nonlinear system)

Books:

1.B.C.Kuo, Digital Control System, Oxford

2.George Stephanopoulos, Chemical Process Control, PHI

3.M. Gopal, Digital Control System, New Age

4.K. Ogata, Discrete Time Control Systems, Pearson Education Inc

5.D.Dirankov, H.Hellendoorn, M.Reinfrank, Introduction. to Fuzzy Control, Narosa

6.B. G. Liptak(ed.), Instrument Engineers' Handbook vol-2, CRC Press

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**	**PSO1**	**PSO2**
EI702.1	3	3	2	2	2	2	1	1	1	1	1	1	1	1
EI702.2	3	3	2	2	3	2	1	1	1	1	1	1	1	1
EI702.3	3	3	2	3	3	2	1	1	1	1	1	1	1	1
EI702.4	3	3	3	2	3	2	2	1	2	2	2	1	1	1

DIGITAL IMAGE PROCESSING
CODE: EI 703A
CONTACTS: 3L
CREDITS: 3
LECTURES: 36

Prerequisite: Digital Signal Processing, Signals And Systems

Course Objective:

To learn basic concepts of digital filter and transform techniques for image processing and feature extraction.

To know the overview of common heuristic algorithms for Image Processing.

To learn about digital image processing sampling and quantization techniques.

Course Outcome:
After the completion of the course, learner will be able to:

EI703A.1: Understand image formation and the role human visual system plays in perception of gray and color image data.

EI703A.2: Get broad exposure to and understanding of various applications of image processing in industry, medicine, and defense.

EI703A.3: Learn the signal processing algorithms and techniques in image enhancement and image restoration.

EI703A.4: Acquire an appreciation for the image processing issues and techniques and be able to apply these techniques to real world problems.

EI703A.5: Be able to conduct independent study and analysis of image processing problems and techniques.

Module 1:

Digital Image Processing Systems: Introduction to human eye, Image formation techniques in the human eye, Brightness adaptation and discrimination techniques, Image sensing and acquisition, storage, Processing, Communication techniques. Image sampling and quantization techniques. Spatial and Tonal resolutions, pixels. [4]

Module 2:

Image Transforms (implementation): Introduction to Discrete Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Twiddle factor, Walsh transform, Hadamard transform, Discrete sine and cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform. [7]

Module 3:

Image Enhancement in the Spatial and Frequency Domain: Gray level transformations, Histogram processing, Arithmetic and logical operations, Spatial filtering: Introduction, Smoothing (low pass) and sharpening (high pass) filters. Frequency domain filters: Homomorphic filtering. Basic MATLAB codes to demonstrate the image enhancement and filtering techniques.
[5]

Module 4:

Image Data Compression: Fundamentals, Redundancies: Coding, Inter pixel Psycho-visual, fidelity criteria, Image compression techniques, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone Still Image compression standards, Video compression standards. [7]

Module 5:

Morphological Image Processing: Introduction, algebraic and logical operations, Dilation, Erosion, Opening, closing, Hit or miss transformation, thickening, thinning, skeletonization. Morphological algorithms on binary Images. Morphological algorithm operations on gray-scale Images.
[6]

Module 6:

Image Segmentation, Representation and Description: Detection of discontinuities, Edge linking and Boundary detection, Thresholding Region based segmentation, Image Representation schemes, Boundary descriptors, and Regional descriptors. Basic MATLAB codes to demonstrate the different edge detection techniques. [7]

Text Books:

1.Digital Image Processing, R. C Gonzalez and R. Woods, Indian reprint: Pearson publication, 2001

2.Digital Image Processing, Anil K. Jain, Prentice-Hall, India

3.Digital Image Processing, Sanjay Sharma, S. K. Kataria & Sons

Reference Books:

1.Digital Image Processing, W. K. Pratt, 2nd Edition, John Wiley & Sons

2.Digital Image Processing and Analysis, B. Chanda & D. Dutta Majumder, Prentice-Hall, India

3.Image Processing - Theory, Algorithms & Architecture, M. A. Sid-Ahmed, McGraw-Hill

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs for Course	**PO1**	**PO2**	**PO3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO2**
EI703A.1	1	2	3	2	1	0	3	1	2	2	1	1	2	2
EI703A.2	2	2	1	1	1	0	1	0	2	3	3	2	1	3
EI703A.3	2	2	1	1	0	1	2	1	1	2	3	3	2	3
EI703A.4	2	2	1	3	0	1	3	1	2	2	3	3	2	2

NON-CONVENTIONAL ENERGY SOURCES
CODE: EI703B
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 32

Prerequisite: Knowledge of basic chemistry & physics; Knowledge of basic thermodynamics.

Course Objective:

To know different nonconventional energy resources.
To explain the different techniques of energy extraction from non conventional energy resources.
To understand and compare the different energy conversion technique.
To chose and design the energy conversion plant after survey the suitability fruitfulness of the plant.

Course Outcome:

Student will be able to

EI703B.1: Explain the different non-renewable sources.
EI703B.2: Apply solar energy in different Field using photo voltaic cells.
EI703B.3: Analyses the performance and testing of different energy resources.
EI703B.4: Design parameters of the nonconventional energy plants.

Module I:Introduction to Energy Sources: [2L]

Renewable and non-renewable energy sources, energy consumption as a measure of Nation's development;
strategy for meeting the future energy requirements Global and National scenarios, Prospects of renewable energy sources. Impact of renewable energy generation on environment.

Module II: Solar Energy & Applications photovoltaic cell: [10L]

Solar radiation: beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length.
Flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance;
Photovoltaic - solar cells, different types of PV Cells, Mono-poly Crystalline and amorphous Silicon solar cells. Design of PV array. Efficiency and cost of PV systems & its applications. PV hybrid systems. Types and performance characteristics. Characteristics equivalent circuit photo voltaic effect photo voltaic for battery charging applications.

Solar air heaters-types, solar driers, storage of solar energy-thermal storage, solar pond , solar water heaters, solar distillation, solar still, solar cooker, solar heating & cooling of buildings, Solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. Solar cell power plant and limitations Solar collecto

Module II: Biomass Energy Systems: **[4L]**

Availability of Biomass and it's conversion theory, production processes, Gasification, Anaerobic Digestion, Pyrolysis, Biogas, performance analysis and testing.

Module III:Wind energy: **[8L]**

Wind distribution, principles of wind energy conversion basic components of wind energy conversion

advantages and disadvantages, principles of operation of wind turbines, types of wind turbines and characteristics, Generators for wind Turbines, Control strategies. Performance and limitations of energy conversion systems.

Module IV: Geothermal Ocean, wave & Tidal energy: **[8L]**

Resources of geothermal energy, thermodynamics of geothermal energy conversion- electrical conversion, non electrical conversion, environmental considerations.

Principle of working of various types of fuel cells and their working, performance and limitations.

Ocean Thermal Energy conversion: Availability, theory and working principle, performance and limitations.

Wave and Tidal wave: Principle of working, performance and limitations, waste recycling plants.

Text Books:

1.G.D.Rai"Non Conventional Energy sources", Khanna publishers, New Delhi, 1999.
2.G.N.Tiwari and M.K.Ghosal, "Renewable energy resources, Basic principles and applications", Narosa Publishing house, New Delhi.
3.S.N.Badra, D.Kastha and S.Banerjee"Wind electricalSustems", Oxford University press, New Delhi.
4.M.V.R.KoteswaraRao"Energy resourcesConventional&Non conventional" BS publications Hyderabad, 2004.
5.Gilbert M.Masters "Renewable and Efficient electric power systems" Wileyinterscience Publications, 2004

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	P011	P012	PSO1	PSO2
EI703B.1	3	-	3	2	-	2	1	-	-	-	1	1	1	2
EI703B.2	3	2	1	2	2	2	-	-	-	-	-	-	2	1
EI703B.3	3	1	1	-	1	2	-	1	-	-	-	-	1	2
EI703B.4	2	2	2	3	2	1	-	-	1	1	-	2	2	1

ANALYTICAL INSTRUMENTATION
CODE: EI703C
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 30

Prerequisite: Knowledge of measurement methods of various process parameters

Course Outcome:

After completion of the course, the students will be able to

EI703C.1: explain the physical properties of samples like pH, viscosity, humidity and moisture.
EI703C.2: describe the composition of various gas and liquid samples.
EI703C.3: choose the elements present in the given sample using analytical techniues.
EI703C.4: apply and use chromatography in real time industrial environments.

Module I: [6L]

Introduction to Analytical Instrumentation: Classification, types of Instrumental methods
Measurement of Humidity: dry & wet psychrometer, hair hygrometer, Electrolysis type hygrometer
Moisture: electrical conductivity type, capacitive method type, IR method
Viscosity: Saybolt's viscometer, rotameter type viscometer, Searle's rotating cylinder type
Density: pressure head type, buoyancy effect type, radioactive type, photoelectric type, displacer type
Gas Analysis: a) Thermal conductivity method
b) Heat of Reaction method.
Oxygen Analysis: a) Magneto Dynamic instrument (Pauling cell)
Thermomagnetic type or Hot wire type instrument.
Zirconia oxygen analyzer.

Module II: [8L]

Liquid analysis:a) Electrodes-Ion selective, Molecular selective types- their variations.
pH analysis: pH electrodes, circuit for pH measurement and applications.
Conductivity cells – standards, circuits.
d) Polarography- apparatus, circuits and techniques-pulse polarography, applications
Colorimetry

Module III: [10L]

Spectroscopic Methods: Introduction, Laws relating to absorption of radiation, Molecular Absorption Spectroscopy in UV & VIS ranges: sources, wavelength selectors, sample container, detectors Spectrophotometers (Single beam & Dual beam arrangement)
Atomic Absorption & Emission spectroscopy : Atomizers, sources, single & dual beam arrangement.
Atomic X Ray spectrometry : Absorption & diffraction phenomena, sources, detectors, techniques. IR Spectroscopy : sources, monochromators, detectors. IR Spectrometer, FT-IR spectrometers.
Introduction to NMR

Module IV: [6L]

Chromatography :Introduction, basic definitions, some relationships. Gas chromatography : basic parts, columns ,detectors, techniques. LC : types, HPLC : basic parts, sample injection system, column, detectors, Applications..

Books:

1.Principles of Industrial Instrumentation- D.C. Patranabis, Publisher: Tata
2.McGraw Hill Analytical Instrumentation- B.G. Liptak
3.Principles of Instrumental Analysis- Skoog, Holler, Nieman, Publisher: Thomson Brooks/Cole
4.Introduction to Instrumental Analysis- Robert D. Braun, Publisher: Pharma Book Syndicate
5.Handbook of Analytical Instruments- R.S. Khandpur, Publisher: Tata McGraw Hill

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI703C.1	2	2	-	1	3	3	3	-	2	-	3	3	3	2
EI703C.2	2	3	1	1	3	3	2	1	2	1	1	3	3	2
EI703C.3	3	2	1	-	3	3	-	3	2	1	3	3	2	3
EI703C.4	2	2	-	1	3	3	1	1	2	-	2	3	2	3

COMPUTER NETWORKING
CODE :CS(EI)714A
CONTACT :3L
CREDIT : 3
TOTAL NO. OF LECTURES: 36

Prerequisite:
Familiarity and knowledge of Operating Systems and Computer Architecture
Also require little bit programming languages concepts like C, Java.

Course Objective:

To educate basic knowledge of networking technologies and network management concepts To interpret the layering concepts in computer networks.
To analyze the functions of each layer and gain knowledge in different applications that use computer networks.
To emphasize the hand-on experience of network topology in a laboratory environment To be familiar with contemporary issues in networking technologies.

Course Outcome:

After completion of the course students will be able to

CS(EI)714A .1: Understand Basic introduction of Computer Network along with Physical layer of OSI and TCP/IP model.
CS(EI)714A .2: Analyze Data link layer protocols with MAC and LAN technologies.
CS(EI)714A .3: Design applications using internet protocols, routing and UDP,TCP.
CS(EI)714A .4: Develop application layer protocols and understand socket programming .

Module I: Introduction [6L]
Introduction (3L):
Introduction: Computer Network, data communication, topology, OSI & TCP/IP Reference Models, layers and characteristics, Wireless Network, comparison to wired and wireless network.

Physical Layer: [3L]

Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network;

Module II: Data Link Layer [10L]

Framing, Error Control, Error Detection and Correction, Flow Control, Data Link Protocols, Simple Stop-and-Wait Protocol, ARQ mechanism, Sliding Window Protocols, One-Bit Sliding Window Protocol, Go-Back-N and Selective Repeat, HDLC, PPP Medium Access Control Sub-layer, The Channel Allocation. **[5L]**

Multiple Access Protocols **:** ALOHA, Carrier Sense Multiple Access Protocols, IEEE 802.x Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet, Wireless LANs - IEEE 802.xx , Bluetooth, RFID, Bridges, Virtual LANs, Switching**.[5L]**

Module III: Network Layer [10L]

IP Addressing, IPv4 and IPv6. Difference IPv4 and IPv6, Conversion of IPv4 and IPv6 , Subnetting, Supernetting, Design Issues, Store-and-Forward Packet Switching, Virtual-Circuit and Datagram Networks, ARP, IP, ICMP, IPV6, BOOTP and DHCP–Delivery protocols Other Protocols such as mobile IP in wireless Network**.. [5L]**

Routing: Shortest Path Algorithms, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing, : RIP, OSPF, BGP; Routing for Mobile Hosts**. [5L]**

Transport layer: [6L]

Process to Process delivery; UDP; TCP, SCTP, TCP RENO, TCP/IP in Wireless environment, Congestion control in TCP :Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm. **[5L]**

Advanced topic such as Remote Procedure Call, Delay Tolerant Networks.**[1L]**

Module IV: Application Layer [4L]

Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW: Cryptography (Public, Private Key based), Digital Signature, Firewalls

Socket Programming [2L]

Introduction to Socket Programming, UDP socket and TCP Socket

Text books:

1.B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH S.
2.Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
3.W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education 4.
4.Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

Recommended books:

1.Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education
2.Leon, Garica, Widjaja – "Communication Networks" – TMH
3.Walrand – "Communication Networks" – TMH.

4.Comer – “Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)” – Pearson Education/PHI

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS(EI)714A.1	1	2	-	1	3	-	2	-	2	-	1	-	1	1
CS(EI)714A.2	3	2	1	2	-	1	-	1	3	1	-	2	1	1
CS(EI)714A.3	1	3	2	2	2	-	3	-	2	-	2	1	1	1
CS(EI)714A.4	2	2	3	-	3	2	1	-	2	1	-	1	1	1

COMPUTER GRAPHICS AND MULTIMEDIA
CODE: CS(EI)714B
CONTACT:3L
CREDITS:3
TOTAL CONTACT HOURS:35

Prerequisite:

Computer Programming, Mathematics

Course Objective:
After completion of this course student will be able to :

1.To develop an understanding and awareness how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users.
2.To become familiar with various software programs used in the creation and implementation of multi-media
3.To gain knowledge about graphics hardware devices and software used.
4.To understand the two-dimensional, three-dimensional graphics and their transformations.
5.To appreciate illumination and color models
6.To become familiar with understand clipping techniques

Course Outcome:
After completion of this course student will be able to

CS(EI)714B.1 : Understood Different types of Multimedia File Format.
CS(EI)714B.2 : Apply Illumination, color models and clipping techniques to graphics.
CS(EI)714B.3 : Design and apply three dimensional graphics and transformations.
CS(EI)714B.4 : Design and apply two dimensional graphics and transformations.

Module I:TWO-DIMENSIONAL GRAPHICS [7L]

Two dimensional geometric transformations, Matrix representations and homogeneous coordinates, composite transformations, Two dimensional viewing , viewing pipeline, viewing coordinate reference frame, window-to-viewport coordinate transformation, Two dimensional viewing functions, clipping operations, point, line, and polygon clipping algorithms.

Module II: ILLUMINATION AND COLOR MODELS [7L]

Height sources, basic illumination models, halftone patterns and dithering techniques, Intuitive colour concepts, RGB colour model, YIQ colour model, CMY colour model, HSV colour model, HLS colour model, Colour selection. Output primitives, points and lines, line drawing algorithms, loading the

frame buffer, line function; circle and ellipse generating algorithms, Pixel addressing and object geometry.

Module III:THREE-DIMENSIONAL GRAPHICS [7L]

Three dimensional concepts, Three dimensional object representations, Polygon surfaces, Polygon tables, Plane equations, Polygon meshes, Curved Lines and surfaces, Spline representations, Bezier curves and surfaces, B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations, Translation, Rotation, Scaling; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping.

Module IV: MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING [7L]

Multimedia basics, Multimedia applications, Multimedia system architecture, Evolving technologies for multimedia, Defining objects for multimedia systems, Multimedia data interface standards, Multimedia databases. Compression and decompression, Data and file format standards, Multimedia I/O technologies, Digital voice and audio, Video image and animation, Full motion video, Storage and retrieval technologies.

Module V: HYPERMEDIA [7L]

Multimedia authoring and user interface, Hypermedia messaging, Mobile messaging, Hypermedia message component, Creating hypermedia message, Integrated multimedia message standards, Integrated document management, Distributed multimedia systems.

TEXT BOOKS:

Hearn Baker Carithers, - “Computer Graphics with Open GL”, Pearson New International Edition

REFERENCES:

1.Donald Hearn and Pauline Baker M, ―Computer Graphics”, Prentice Hall, New Delhi, 2007 [UNIT I – III]

2.Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003.[UNIT IV,V]

3.Judith Jeffcoate, ―Multimedia in practice: Technology and Applications, PHI, 1998.

4.Foley, Vandam, Feiner and Hughes, ―Computer Graphics: Principles and Practice, 2nd Edition, Pearson Education, 2003.

5.Jeffrey McConnel, ―Computer Graphics: Theory into Practice, Jones and Bartlett Publishers, 2006.

6.Hill F S Jr., “Computer Graphics”, Maxwell Macmillan, 1990.

7.Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, ―Fundamentals of Computer Graphics, CRC Press, 2010.

8.William M. Newman and Robert F.Sproul, ― Principles of Interactive Computer Graphics, Mc Graw Hill 1978.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS(EI)714B.1	2	3	-	2	1	2	-	1	-	-	1	1	2	2
CS(EI)714B.2	2	2	1	-	3	-	2	-	1	-	-	-	2	2
CS(EI)714B.3	2	2	3	3	-	1	-	1	-	-	1	-	2	2
CS(EI)714B.4	3	1	2	2	2	-	1	-	-	-	1	1	2	2

OBJECT ORIENTED PROGRAMMING
CODE: CS(EI)714C
CONTACT: 3L
CREDITS: 3
TOTAL LECTURES: 36

Prerequisites:
Computer Fundamentals
Basic understanding of Computer Programming and related Programming Paradigms Problem Solving Techniques with proper logic Implementation. Basic Computer memory architecture with data accession.

Course Objective:

It demonstrates that how can you change the implementation of an object without affecting any other code by increasing data security and protecting unwanted data access. (Encapsulation).
It allows you to have many different functions, all with the same name, all doing the same job, but depending upon different data. (Polymorphism).
It guides you to write generic code: which will work with a range of data, so you don't have to write basic stuff over, and over again. (Generics).
It lets you write a set of functions, then expand them in different direction without changing or copying them in any way. (Inheritance)

Course Outcome:
After completion of the course students will be able to:

CS(EI)714C.1: Define the basic knowledge of Object Orientation with different properties as well as different features of Java Oriented Programming.

CS(EI)714C.2: Analyze various activities of different string handling functions with various I/O operations .
CS(EI)714C.3: Design the process of interaction between Objects, classes & methods w.r.t. Object

CS(EI)714C.4:develop Inheritance, Package, Interface, Exception handling, Multithreading and Applet(Web programs in java) concepts in Java.

Module 1: [5L]

Introduction:

Object Oriented Analysis & Design-Concepts of object oriented programming language, Object, Class.**[1L];** Relationships among objects and classes-Generalization, Specialization, Aggregation, Association, Composition, links, Meta-class. **[1L] ;**Object Oriented Programming concepts - Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, Method. **[1L];** Properties of OOP- message passing, inheritance, encapsulation, polymorphism, Data abstraction. **[1L];** Difference between different OOPs Languages. **[1L].**

Module 2: [9L]

Java Basics:

Basic concepts of java programming - Advantages of java, Byte-code & JVM, Data types, Different types of Variables. **[1L] ;**Access specifiers, Operators, Control statements & loops. **[1L];** Array. **[1L] ;**Creation of class, object, method. **[1L];** Constructor- Definition, Usage of Constructor, Different types of Constructor. **[1L];** finalize method and garbage collection, Method & Constructor overloading. **[1L];** this keyword, use of objects as parameter & methods returning objects. **[1L];** Call by value & call by reference. **[1L];** Static variables & methods. Nested & inner classes. **[1L].**

Module 3:[4L]

Basic String handling & I/O :

Basic string handling concepts- Concept of mutable and immutable string, Methods of String class- charAt(), compareTo(), equals(), equalsIgnoreCase(), indexOf(), length() , substring(). **[1L];** toCharArray(), toLowerCase(), toString(), toUpperCase() , trim() , valueOf() methods, Methods of String buffer class- append(), capacity(), charAt(), delete(), deleteCharAt(). **[1L];**

ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString(). **[1L] ;**Command line arguments, basics of I/O operations – keyboard input using BufferedReader& Scanner classes. **[1L].**

Module 4: [8L]

Inheritance and Java Packages :

Inheritance - Definition, Advantages, Different types of inheritance and their implementation. **[1L] ;**Super and final keywords, super() method. **[1L];** Method overriding, Dynamic method dispatch. **[1L];** Abstract classes & methods. **[1L];** Interface - Definition, Use of Interface. **[1L];**

Multiple inheritance by using Interface. **[1L] ;**Java Packages -Definition, Creation of packages. **[1L];** Importing packages, member access for packages. **[1L]**

Module 5: [10L]

Exception handling, Multithreading and Applet Programming :

Exception handling - Basics, different types of exception classes. Difference between Checked & Unchecked Exception. **[1L];** Try & catch related case studies.**[1L];** Throw, throws & finally. **[1L];** Creation of user defined exception. **[1L];** Multithreading - Basics, main thread, thread life cycle.**[1L];** Creation of multiple threads-yield(), suspend(), sleep(n), resume(), wait(), notify(), join(), isAlive().**[1L]**

;Thread priorities, thread synchronization.**[1L];**Interthread communication, deadlocks for threads**[1L];** Applet Programming - Basics, applet life cycle, difference between application & applet programming**[1L];** Parameter passing in applets. **[1L]**

Recommended Books:

Textbooks:

1.Herbert Schildt – "Java: The Complete Reference " – 9th Ed. – TMH

2.E. Balagurusamy – " Programming With Java: A Primer " – 3rd Ed. – TMH.

References:

1.R.K Das – " Core Java for Beginners " – VIKAS PUBLISHING.

2.Rambaugh, James Michael, Blaha – " Object Oriented Modelling and Design " – Prentice Hall, India.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS(EI)714C.1	3	3	2	2	2	-	-	-	1	1	-	2	2	1
CS(EI)714C.2	3	2	1	1	1	-	-	-	2	1	2	2	2	1
CS(EI)714C.3	3	3	3	1	1	-	2	-	2	2	1	2	2	1
CS(EI)714C.4	3	2	2	2	2	1	-	-	2	2	2	2	2	1

TELEMETRY AND REMOTE CONTROL LAB
CODE: EI 791
CONTACT: 3P
CREDITS: 2
Course Outcome:

After completion of the laboratory course students will be able to:

EI791.**1**: explain basic computational properties of remote sensing data cquisition, storage, and processing.
EI791.**2:** explain at a basic level fundamental physical principle of remote sensing
EI791.**3**: Apply mathematical relationships describing fundamental physical, geometric, and computational principles relevant to remote sensing.
EI791.**4:** Demonstrate proficiency and conceptual understanding in using software or manual Techniques to carry out remote sensing image processing and analysis through a series of laboratory exercises and reports.

Experiments:

1.Study of voltage telemetry system using a process variable transducer.
2.Study of 4-20 mA current telemetry system: 2 wire and 3 wire systems.
3.Study of a frequency telemetry system using a VCO and a PSD.
4.Study of a FDM and Demultiplexing system using wire transmission for 2 to 4 channels.
5.Study of a PCM system.
6.Study of a Bio – Telemetry System.
7.Study of a (wireless) remote control system.
8.Study of Computerized control wireless telemetry system.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI791.1	3	2	2	1	1	-	-	1	-	1	1	-	2	2
EI791.2	3	2	1	-	1	2	-	1	-	-	1	1	2	2
EI791.3	3	3	3	1	-	-	-	-	1	-	1	1	1	2
EI791.4	2	2	2	1	1	-	-	2	1	1	-	1	1	2

COMPUTER NETWORKING LAB
CODE: CS(EI)784A
CONTACT :3P
CREDIT POINT: 2

Course Outcome(s)
After completion of the laboratory course students will be able to:
CS(EI)784A .1: Installation of different Network devices, simulators, hardware connection using cables and other tools.
CS(EI)784A .2: Demonstrate TCP & UDP using socket program.
CS(EI)784A .3: Developthecode for Data link layer protocol simulation.
CS(EI)784A .4: Examine the performances of Routing protocol with congestion control algorithm using network simulator

Experiments:

1.Familiarization of UNIX or Linux environment, UNIX or Linux general Commands specially Network Commands. Familiarization of Internetworking - Network Cables - Color coding - Crimping. Internetworking Operating Systems - Configurations. **[6L]**
2. Implementation of flow control mechanisms [3L]
3.Socket Programming using TCP and UDP **[15L]**
4.Implementing routing protocols such as RIP, OSPF. **[2L]**
5.Familiarization of advanced simulators like Packet Tracer, NS2/NS3, OMNET++, TinyOS**[4L]**
6.Server Configuration: only web server (If time permit..instructor can do more than that) **[6L]**

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CS(EI)784 A .1	1	2	1	1	-	-	-	-	2	-	-	1	1	2
CS(EI)784 A .2	-	2	1	-	-	-	2	-	3	-	1	1	1	2
CS(EI)784 A .3	1	3	-	2	2	-	1	-	2	-	1	-	1	1
CS(EI)784 A .4	2	2	-	-	3	2	-	-	2	1	-	1	1	1

COMPUTER GRAPHICS AND MULTIMEDIA LAB
CODE : CS(EI)784B
CONTACT HOURS :3P
CREDITS:2

Course Outcome :
After completion of this course student will be able to

CS(EI)784B.1: Analyze the effects of scale and use on both presentation and lower level requirements
CS(EI)784B.2: Create 3D graphical scenes using open graphics library suits
CS(EI)784B.3: Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.
CS(EI)784B.4: Designimage manipulation,enhancement,and basic transformations on objects and clipping algorithm on lines

Course Content:
IMPLEMENT THE EXERCISES USING C /C++/ OPENGL / JAVA
Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes, Circle (Midpoint)
2D Geometric transformations – Translation, Rotation Scaling , Reflection Shear, Window-Viewport Composite 2D Transformations
Line Clipping
3D Transformations - Translation, Rotation, Scaling.
3D Projections – Parallel, Perspective.
Creating 3D Scenes.
Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
2D Animation – To create Interactive animation using any authoring tool.
VLC and Video Streaming
HTML 5 and media publishing with Projects based learning.Web document creation using Dreamweaver.
Creating Animation using Flash.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CS(EI)784B.1	**1**	**3**	**2**	**3**	**1**	**2**	**1**	**-**	**1**	**1**	**-**	**-**	**2**	**2**
CS(EI)784B.2	**1**	**2**	**3**	**2**	**2**	**-**	**1**	**-**	**-**	**1**	**1**	**-**	**2**	**2**
CS(EI)784B.3	**2**	**3**	**2**	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**1**	**1**	**2**	**2**
CS(EI)784B.4	**1**	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**2**	**2**	**2**

Object Oriented Programming Lab
CODE: CS(EI)784C
CONTACT: 3P
CREDITS: 2
Course Outcome(s)
After completion of this course student will be able to
CS(EI)784C .1: Createtheprocedureof communication between Objects, classes &methods.
CS(EI)784C.2: UnderstandtheelementaryfactsofObjectOrientationwithvariouscharacteristicsaswellas several aspects of Java.
CS(EI)784C.3: Analyzed istinct features of different stringh and ling functions with various I/O operations.
CS(EI)784C.4: Discuss Inheritance,Package,Interface,Exceptionhandling,Multithreading and Applet(Web program in java)programming concepts in Java.

Experiments:
Assignments on Basic Object oriented programming in java using class-object & method, constructor (Default constructor, parameterized constructor, Copy constructor), method/constructor overloading.
Assignments on Inheritance (Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance) method overriding.
Assignments on Dynamic method Dispatch, encapsulation, this keyword, super keyword &super () method, static keyword, final keyword.
Assignments on developing Data abstraction- Abstract class & abstract methods, interfaces- multiple inheritance, extending interfaces.
Assignments on creating and accessing packages, exception handling (Different case studies of try-catch-finally block, chained exception, used defined exception with throw and throws keyword.)
Assignments on multithreaded programming-Thread creation, different method implementation of Thread life cycle (yield(),suspend(),resume(),sleep(n),join(),isAlive(), wait(), notify()), Thread priority, Thread Synchronization.Assignments on applet programming.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS(EI)784C.1	1	3	2	3	1	2	-	-	-	1	-	-	2	2
CS(EI)784C.2	1	2	3	2	2	-	1	-	-	-	1	-	2	2
CS(EI)784C.3	2	3	2	1	1	-	-	1	-	1	-	1	2	2
CS(EI)784C.4	1	1	1	1	1	-	1	-	1	-	-	2	2	2

FOREIGN LANGUAGE
Code: MC781
Contacts: 2L
Credits: 0
Total contact hours: 20

Pre-requisites:
Basic high school level reading, writing and communication skills in English.

Course outcomes: By the end of the course the students will be able to
MC781.1 Read basic French and interpret the meaning
MC781.2 Construct simple sentences in French
MC781.3 Interact with others and hold simple conversations in French

The proposed syllabus is as follows:

Unit 1 100 marks

Vocabulaire

L' alphabet français (The Alphabets)
Les nombres (cardinaux et ordinaux) (Numbers)
Les mois de l'année (The Months of the Year)
Les saisons (The Seasons)
Les jours de la semaine (The Days of the Week)
Les couleurs (The Colours)
La famille (The Family)
Les nationalités (The Nationalities)

Grammaire
Les Verbes—être, avoir et aller
Nouns—Gender and Number
Les articles (définis, indéfinis, contracté et partitif)
Les adjectifs—possessifs et demonstraifs

Français Intéractif (Listening and Speaking)
Les salutations
Les forms de politesse
Présentez-vous (About Yourself)

Unit 2

Vocabulaire
L'heure (the time)
La maison (the house)
Le corps (the body)
Les vêtements (clothes)
Les professions (professions)
Les loisirs (pastimes)
Le sport (Sports)
Grammaire
Le Verbes—voir, savoir, venir, aller, sortir, connaître, partir.
Les négations

Le futur
Les interrogatifs
Français Intéractif (Listening and Speaking)
Décrivez les images
La dictée
Liséz le journal

Unit 3

Vocabulaire
La nourriture (Food)
Les repas (Meals)
Les légumes (Vegetables)
Les fruits (Fruits)
Les fleurs (Flowers)
Les animaux (Animals)
Les oiseaux (Birds)

Grammaire
Les adverbes
Les adjectifs
Les prépositions
Français Intéractif (Listening and Speaking)
Ecoutez la radio/la télévision
Dialogues—À la médecin, au café, a la gare

Unit 4

Vocabulaire
Le jardin (The Garden)
Le temps (the weather)
Les voyages (Travel)
La ville (the City)
Les vacances (Holidays)

Grammaire
Pronoms interrrogatifs
Mood—subjonctif et l'impératif

Français Intéractif (Listening and Speaking)
Se présenter (expressing ideas/opinions on general topics)
Ecoutez le programme sur la radio/la télévision

Recommended Texts:
Le Nouveau Sans Frontières-1 (Paris: CLE International, 1999)
Dondo, Modern French Course (1930, Oxford:Oxford UP, 1999)
Dictionnaire Larousse

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P010**	**P011**	**P012**	**PSO1**	**PSO2**
MC781.1	2	-	-	3	-	3	2	2	3	3	-	3	2	3
MC781.2	2	3	3	3	-	3	3	3	2	3	-	3	3	3
MC781.3	1	3	3	3	-	2	2	2	2	3	-	2	3	3

Autonomy Curriculum and Syllabus of B.Tech Programme
Implemented from the Academic Year 2016 AEIE
Department

4th Year: 8th **Semester**

THEORY:

Sl. no.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	HS	HU804	Industrial &Financial Management	2	0	0	2	2
2	PE	EI801A/ EI801B/	Plant Automation/ Embedded System Design/ Virtual Instrumentation	3	0	0	3	3
3	PE	EC(EI) 802A/ EC(EI)802B/	Mobile Communication/ VLSI & Microelectronics/ Mechatronics	3	0	0	3	3
Total Theory							8	8

PRACTICAL & SESSIONAL:

Sl.	Field	Code	Subjects	Contact hours/week				Credit points
				L	T	P	Total	
1	PC	EI 891	Instrumentation & Control Lab	0	0	3	3	2
2	PW	EI 892	Project-2	0	0	12	12	6
3	PW	EI893	General Viva-voce					4
Total sessional							15	12
Total 8th semester							23	20

Industrial & Financial Management
Paper Code: HU805
Total Contact Hours: 42
Credit: 2

Pre requisite:

Mathematics, English

Course Objective:

Introduce students to financial management and its importance and its applications in business, their relationship with the business environment and the role and functions of chief financial officer.
Introduce students to financial planning, and objectives, and its benefits, and the types of areas and stages of financial planning, and the factors that help the success of financial planning.
Introduce students to the methods used in financial planning to assess the short-term financial needs.
Introduce students to time value of money and its relationship to the objectives of financial management, rationale for using the time value of money, and simple and compound interest and how to calculate it, and also to understand the present value of the future payments.
Introduce students to major financial statements of businesses as well as the definition of the purposes and tools of financial analysis and its importance in the financial control process. Introduce students to the basics of investing in securities through exposure to the following points: knowledge of financial markets, and their components, and functions of the financial market, and the parties worked in the financial markets, the stock traded in the money markets and capital markets, then find out the efficiency standards of the financial market, as well as valuations of Shares and bonds.
Giving students how to apply full financial cycle and makes the necessary adjustments on service and commercial installations.
Giving student's of Application processors to finance small projects.

Course Outcome :

After completion of this course students will be able to

HU805.1: Explain and describe various technology-based business models and the dynamics of value creation, value proposition, and value capture in industrial enterprises.

HU805.2: Select, interpret and use different costing techniques as a basis for decisions in various business situations.

HU805.3: Understand the basic principles of financial accounting and reporting.

HU805.4: Produce and interpret an industrial company’s Annual Statement, at a basic level.

HU805.5: Describe the operations of an industrial enterprise from various perspectives, and analyze its basic strengths and weaknesses based on concepts from the field of Industrial Management.

HU805.6: Explain how the industrial company markets and price it’s products considering GST.

MODULE I[12L]:
Introduction to Accounting, Important Definitions, Basic concepts and conventions, Types of Accounts with Golden Rule of Accounting, Journal, Ledger and Trial Balance, Preparation of Trading Account, Profit & Loss A/C and Balance Sheet for business organizations.

MODULE II[13L]:
Financial Management, Introduction to Financial Management, Introduction, Definition and concept, scope, objective, functions of Finance Manager. Ratio Analysis: Definition, Objectives, Advantages &Disadvantages.
Classification of Ratios: Liquidity ratios, Capital Structure ratios, Activity ratios & Profitability Ratios, Capital Budgeting: Nature of Investment Decision, Importance of Capital Budgeting, capital budgeting process, Investment criteria, payback period, Rate of return, cash flow, discounting cash flow NPV method and IRR method, Benefit cost ratio, ARR.

MODULE III[8L]:

Cost Accounting: Introduction to cost accounting-Cost Centre, Cost unit, Elements of costs, Statement of cost or cost sheet, Marginal cost & C-V-P analysis with BEC. Budget and Budgetary Control: Concepts of Budget, Budgeting and budgetary control, advantages, disadvantages, uses, Master Budget, Zero Based Budget ,Cash budget, Flexible budget.

MODULE IV[5L]:
Working capital management**,** Introduction-working capital concept-financing working capital-importance of working capital-management of working capital-working capital cycle-management of different components of working capital-working capital forecast.

MODULE V[4L]:
Introduction to GST-Basic concept and application.

Text Books:
Financial Management, Khan & Jain, S. Chand
Management Accounting, Khan & Jain, S. Chand
Modern Accountancy, Haniff& Mukherjee, TMH

Reference Books:
An Introduction to Accountancy, S.N.Maheswari, Vikas publication
Cost Accounting: Theory and Practices, B. Banerjee, PHI
Financial Management, IM Pandey, Vikas

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
HU805.1	-	1	1	2	-	2	-	-	-	-	-	-	2	2
HU805.2	-	-	-	-	3	1	2	-	-	-	1	-	2	2
HU805.3	3	-	-	-	-	2	-	-	-	-	3	-	2	2
HU805.4	-	2	-	-	1	-	1	-	-	-	-	-	2	2
HU805.5	-	3	-	2	-	-	-	-	-	-	-	-	2	2
HU805.6	-	2	2	3	-	-	-	-	-	-	2	-	2	2

PLANT AUTOMATION
CODE: EI 801A
CONTACT: 3L
CREDITS: 3
TOTAL CONTACT HOURS: 32

Prerequisite: Knowledge of Process Control

Course Objective:

The objective of this course is to provide the student with basic skills useful in identifying the concepts of automated machines and equipment and describe the terms and phrases associated with industrial automation.

Course Outcome:

Upon completion of this course, the student will be able to
EI 801A.1:understand the operational functions of PLC,DCS and SCADA.
EI801A.2:demonstrate the competence in maintaining and troubleshooting technology ,detecting more serious problems, generating workable solutions to correct deviations and recognizing when to get additional help.
EI801A.3:analyze Industrial Networking, Networking protocols and topologies.
EI801A.4:analyze the automation technologies in different types of plants.

Module I: [4]

Introduction to Plant Automation, Architecture,Recapitulation Basic Components and Functions of DCS, PLC, HMI (OS and ES); ISO/OSI Reference Model; TCP/IP Basics, Industrial Ethernet, Fieldbus, Network Access Protocols, Network Topology and Arbitration Methods; Computer Integrated Processing; OPC and OLE Connectivity

Module II: [10]

Plant Automation System network Elements of Plant Automation System (PAS) : Smart Sensors, Sensor networks, Intelligent actuators, SCADA systems, I/O Modules (wired and wireless), RTUs, AS-Interface. Safety Interlocks, Sequence Controls PAS network and typical system architecture using the above elements PAS developed into MES (manufacturing execution systems) integrated with high level software

Module III: [6]

Automation Solutions: PLC based systems, HMI and SCADA based systems PC based automation systems, Safety in industries.

Module IV: **IIOT [4]**

Introduction, What is IoT, What is IIoT, Differences between IoT and IIoT, Evolution of IIoT, Architecture of IIoT, IIoT Characteristics, IIoT Platform, IIoT Protocols, Application Areas of IIoT,

Challenges: Adaptability, Scalability, Security; Benefits of IIoT

Module V: **Case Study (any two) [8]**

Paper Mill
Power Plant
Batch Processes
Steel Plant
Food processing industry

Books:

1.Process Automation Handbook : A Guide to Theory and Practice. J LOVE, Springer 2007
2.Overview of Industrial Process Automation, KLS Sharma, Elsevier, 2011
3.Automation Made Easy, P. G. Martin & H. Gregory, ISA, 2009
4.Industrial Automation, Circuit Design and components, D W Pessen
5.Serial Networked Field Instrumentation, JR Jordan, Wiley Series - Measurement Science and Technology Springer Handbook of Automation

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**	**PSO1**	**PSO2**
EI801A.1	3	3	1	-	3	2	1	-	-	1	1	1	1	1
EI801A.2	2	2	-	2	2	1	-	-	-	2	1	1	1	1
EI801A.3	2	1	1	1	3	2	-	-	-	-	-	-	1	1
EI801A.4	2	1	-	1	1	-	1	-	1	-	1	1	1	1

EMBEDDED SYSTEM DESIGN
CODE: EI801B
CONTACT: 3L
CREDITS: 3
TOTAL CONTACT HOURS: 30

Prerequisite: Knowledge of basic microprocessor and microcontroller.

Course Objective:

An ability to design a system, component, or process to meet desired needs within realistic constraints.

Ability to understand microcontroller, microcomputer, embedded system.

Understand different components of a micro-controller and their interactions.

To become familiar with the programming environment used to develop embedded systems.

Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices

Learn debugging techniques for an embedded system

Course Outcome:

After completion of the course, the students will be able to

EI801B.1: Understand the architecture and classifications of different embedded systems and the related programming knowledge.
EI801B.2: Understand the concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices
EI801B.3: Choose case-specific debugging technique for an embedded system.
EI801B.4: Design various real time systems using embedded systems.

Module I: **[3L]**
Introduction to Embedded System: Embedded system Vs General computing systems, Purpose of Embedded systems, classifications of embedded systems, fundamentals of embedded processor and microcontrollers, CISC vs. RISC

Module II: **[7L]**
Serial and parallel communication: devices and protocols, wireless communication: devices and protocols, parallel communication network using ISA, PCI, PCT-X, Internet embedded system network protocols, USB, Bluetooth.

Module III: **[5L]**
Program Modeling Concepts ; Fundamental issues in Hardware software co-design, Unified Modeling Language(UML), Hardware Software trade-offs DFG model, state machine programming model, model for multiprocessor system.

Module IV: **[5L]**

Real Time Operating Systems: Operating system basics, Tasks, Process and Threads, Multiprocessing and multitasking, task communication, task synchronization, qualities of good RTOS.

Module V: [10L]

PIC microcontroller: introduction, architecture, comparison of PIC with other CISC and RISC based systems and microprocessors, assembly language programming, addressing modes, instruction set, Interfacing with various sensors and actuators using PIC microcontroller. Programming concepts and embedded programming.

Text Books:

1.Introduction to Embedded Systems : Shibu K. V. (TMH)

2.Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)

3.Embedded Systems : Rajkamal (TMH)

4.Embedded Systems : L. B. Das (Pearson)

5.Embedded System design : S. Heath (Elsevier)

6.Embedded microcontroller and processor design: G. Osborn (Pearson)

7.Programming PIC microcontrollers with PIC basic by chuck helebuyck

8.PIC microcontrollers-programming in basic by Milan verle

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs for Course	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO12**		**PSO1**	**PSO2**
EI801B.1	3	-	2	1	2	-	-	-	-	-	1	1		1	1
EI801B.2	2	1	3	1	-	-	-	-	-	-	2	-		1	1
EI801B.3	2	2	3	1	-	-	-	-	-	-	1	2		2	1
EI801B.4	3	2	2	-	-	-	-	-	-	-	1	2		2	1

VIRTUAL INSTRUMENTATION
CODE: EI801C
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 31
Prerequisite:
Basic Electricity, Basic electronics, programming languages, Communication engineering

Course Objective:

The objective of this course is:

to introduce the concept of virtual instrumentation

to develop basic VI programs using loops, case structures etc. including its applications in image, signal processing and motion control

Course Outcome:

After the successful completion of the course the students will be able to:
EI801C.1: Understand the various types of structures used in LabVIEW
EI801C.2: explain the working of LabVIEW.
EI801C.3: apply the knowledge of LabVIEW for signal processing, image processing etc.
EI801C.4: analyse and design different type of programs based on data acquisition

Module I: **[8]**

Review of Virtual Instrumentation: Historical perspective, Block diagram and Architecture of Virtual Instruments Data, Review of measurement systems- analog systems, digital systems

Flow Techniques: Graphical programming in data flow, Comparison with conventional programming.

Module II: **[8]**

VI Programming Techniques: VIs and sub-VIs, Loops and Charts, Arrays, Clusters and graphs, Case and sequence structures, Formula nodes, Local and global variables, Strings and file I/O.

Module III:

Data Acquisition Basics: ADC, DAC, DIO, Counters and timers**.** **[8]**

Data acquisition boards – Serial ports: RS-232, USB ; Parallel ports: IEEE-1284, GPIB standard IEEE-488.2 , System buses, Interface buses: PCMCIA, VXI, SCXl, PXI, etc.

Module IV: **[8]**

Virtual instrumentation in LabVIEW: Introduction (Front Panel, Block Diagram)

Data Types, Operators, Instructions, Graphics, Virtual Instrument projects

Books:

1. Johnson, G., LabVIEW Graphical Programming, McGraw Hill (2006).

2.Wells, L.K. and Travis, J., LabVIEW for Everyone, Prentice Hall Inc. (1996).

3.Gupta, S. and Gupta, J.P., PC Interfacing for Data Acquisition and Process Control, Instrument Society of America (1988)

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	P011	P012	PSO1	PSO2
EI801C.1	3	1	2	-	-	-	-	1	-	-	1	1	1	1
EI801C.2	1	1	1	3	2	-	-	-	1	-	-	1	1	1
EI801C.3	1	3	-	2	-	-	1	-	-	-1	1	-	1	1
EI801C.4	2	-	-	3	-	1	1	1	-	1	-	-	1	1

MOBILE COMMUNICATION
CODE: EI 802A
CONTACTS: 3L
CREDITS: 3
TOTAL NO. OF LECTURES: 34

Prerequisite: Analog and Digital Communication System

Course Objective:

To make students familiar with basics of mobile communication systems.
To choose system (TDMA/FDMA/CDMA) according to the cost of installation, complexity, speed of propagation, channel properties etc.
To compare between mobile communication and static communication.
To identify the advantages, limitations and design techniques of 2G and 3G wireless mobile communications.
This subject can be considered as a prerequisite for the course in Wireless LANs.

Course Outcome:

By the end of the course, the student will be able to
EI802A.1: analyze and design wireless and mobile cellular systems.
EI802A.2: analyze the advanced research wireless and mobile cellular programs.
EI802A.3: analyze all the applications of wireless protocols
EI802A.4: design the mobile networks.

Module 1

Introduction: Vision of mobile communication. Historical perspective in the development of mobile communication - 1G to 4G and beyond (5G). Wireless standards. [3]

Module 2

Cellular system principle and planning: Cellular concepts - cell structure, frequency reuse, cell splitting and channel assignments, cellular network architecture. Location updating and Call setup. Hand off techniques and power control. Selection of uplink and downlink frequencies. [8]

Module 3

Global System of Mobile communication (GSM): System overview, GSM architecture. Mobility management. Network signaling. [6]

Module 4

GSM system architecture and function partitioning. Introduction to Mobile System (MS). Base Station System (BSS). Home Location Register (HLR), Visiting Location Register (VLR), Equipment Identity Register (EIR). [6]

Module 5

GSM radio aspects: Wireless medium Access Control – FDMA, TDMA, CDMA, WCDMA. GSM radio standards. Frequency band and channel allocation. [5]

Module 6

Mobile data communication. Wireless LANS (WLANS). IEEE 802.11 Standards, Mobile IP [4]

Module 7

Introduction to GPS systems. [2]

Text Books:

1.Mobile Cellular Telecommunications – Analog & Digital Systems, William C. Y. Lee, McGraw Hill, 1995
2.Mobile Communications Design Fundamentals, William C. Y. Lee, A Wiley-lnterscience Publication
3.Mobile Communications, J. Schiller, Pearson Education

Reference Books:

1.Wireless Communications, T. S. Rappaport, Prentice Hall International, 2002.
2.Wireless Network Evolution, V. K. Garg - Pearson Ed.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EI802A.1	1	2	1	2	1	3	3	1	2	2	1	1	2	2
EI802A.2	2	2	1	1	3	0	1	0	2	3	3	2	2	2
EI802A.3	2	2	1	2	0	1	2	1	3	2	3	3	2	2
EI802A.4	2	2	1	3	0	1	3	2	2	2	3	3	2	2

VLSI & MICROELECTRONICS
CODE: EC(EI)802B
CONTACTS: 3L
CREDITS: 3
TOTAL NO. OF LECTURES: 34

Prerequisite: Concept of courses Solid State Devices ; Analog Electronic Circuit; Digital Electronic and Circuit

Course Objective:

Objective of the course is:

to motivate students to design VLSI circuits in the area of digital , analog to

encourage for the design of IC with low power and high speed .

Course Outcome:

The Students will be able to

EC(EI)802B .1: Understand scale of integration and VLSI design flow and VLSI Design steps.

EC(EI)802B.2 Understand the VHDL basics and to construct the combinational and sequential logic circuits.

EC(EI)802B.3 Describe fabrication steps of IC and construct stick diagram & layout of CMOS inverter and basic gates based on Layout design rules.

EC(EI)802B.4 analyse the different parameters related to the different MOS devices and to design the combinational and sequential logic circuits.

Course Content:

Module –I: Introduction to VLSI Design: (8L)

VLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical), Y-Chart, Digital VLSI Design Steps.

Module-II : MOS structure: (10L)

E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flat band voltage, Potential balance Charge balance, Inversion, MOS capacitances. Three Terminal MOS Structure: Body effect. Four Terminal MOS Transistor: Drain current, I-V characteristics. Current-voltage equations (simple derivation). Scaling in MOSFET, General scaling, Constant Voltage & Field scaling.] CMOS: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate using CMOS.

Module-III: Micro-electronic Processes for VLSI Fabrication: (10L)

Silicon Semiconductor Technology- An Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion, Cleaning, Etching, Photo-lithography – Positive & Negative photo-resist Basic CMOS Technology – (Steps in fabricating CMOS), Basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator Layout Design Rule: Stick diagram with examples, Layout rules.

Module –IV: Hardware Description Language:

VHDL or Verilog Combinational & Sequential Logic circuit Design. (6L)

Text Books:

1. Digital Integrated Circuit , J.M.Rabaey, Chandrakasan, Nicolic, Pearson Education.
2. CMOS Digital Integrated Circuits Analysis and Design , S.M.Kang & Y.Leblebici,TMH.
3. CMOS Analog Circuit Design , Allen & Holberg , Oxford
   Design of Analog CMOS Integrated Circuits , Behzad Razavi , TMH .

Reference Books:

1.Microelectronic Circuits , Sedra & Smith , Oxford
2.Introduction to VLSI Circuits and System , Uyemura ,
3.Wiley VLSI Design , Debaprasad Das , Oxford
4.VLSI Design and EDA Tools , Angsuman Sarkar , Swapnadip De , C.K. Sarkar ,
Scitech
5.VLSI Design Techniques for Analog and Digital Circuits , Geiger , Allen , Strader ,
TMH

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EC(EI)802B .1	2	2	3	1	1	-	-	1	2	1	1	1	2	1
EC(EI)802B .2	3	2	1	2	1	-	-	1	2	1	1	2	2	1
EC(EI)802B .3	3	3	3	2	1	-	-	1	2	1	1	2	2	1
EC(EI)802B .4	2	2	1	1	1	-	-	1	2	1	1	2	2	1

MECHATRONICS
CODE:EC(EI)802C
CONTACTS : 3L+0T
CREDITS : 3
TOTAL CONTACT HOURS: 30

Prerequisite: Knowledge of basic electrical, sensors & transducers, microprocessors and microcontrollers, control system etc's are required .

Course Objective:

Have a strong foundation in science and focus in mechanical, electronics, control, software, and computer engineering, and a solid command of the newest technologies
Be able to design, analyze, and test "intelligent" products and processes that incorporate appropriate computing tools, sensors, and actuators.
Be able to demonstrate professional interaction and communicate effectively with team members.
Be able to work efficiently in multidisciplinary teams.
Be prepared for a variety of engineering careers, graduate studies, and continuing education .
Practice professional and ethical responsibility, and, be aware of the impact of their designs on human kind and the environment.

Course Outcome:
After completion of the course, the students will be able to

EC(EI)802C.1. Apply the knowledge of mathematics, science, and engineering.
EC(EI)802C.2: apply the techniques, skills, and modern mechatronics engineering tools necessary for engineering practice.
EC(EI)802C.3. Design mechatronics component, system or process to meet desired needs.
EC(EI)802C.4. Develop the real time solution of engineering problems.

Module I:Introduction to Mechatronics: **[4L]**
Introduction to Mechatronics: Definition, Mechatronics in design and manufacturing, Comparison between Traditional and Mechatronic approach; Concurrent engineering.

Module II: Electromechanical Drives : **[6L]**

Electrical Drives: Stepper motors, servo drives. Mechanical Drives: Different mechanisms, Ball screws, Linear motion bearings, Transfer systems.

Module III: Robot End effecters & Actuators **[6L]**

Types, mechanical grippers, other types of grippers, Tools as end effecters. Characteristics of actuating systems, Actuating System – Hydraulic devices, pneumatic devices, electric motors, other special actuators.

Module IV: Introduction of robot **[6L]**

Definition of robot, classification of robots according to coordinate system and control method, Main components of robots – manipulator, sensors, controller etc, Robot characteristics – payload, reach, repeatability, accuracy, resolution.

Module V: Sensors and Artificial Intelligence **[8L]**

Characteristics of Sensors, Position sensors, velocity sensors, acceleration sensors,

force and pressure sensors, force and torque sensors, micro switches, touch and slip

sensors, non-contact proximity sensors, Robot Vision System, Robot programming

Languages – VAL, AML/2, ARM BASIC.

Text Books

1.N.P. Mahalik, Mechatronics, Tata McGraw Hill Publication

2.W. Bolton, Mechatronics, Pearson Education

3.A. Smaili and F. Arnold, Mechatronics, Oxford University Press, Indian Edition

4.M.D. Singh and J.G. Joshi, Mechatronics, Prentice Hall of India Pvt. Ltd.

5.K.K. Appuu Kuttan, Mechatronics, Oxford University Press, New Delhi

6.HMT Ltd., Mechatronics, Tata McGraw Hill Publication

7.F.H. Raven, Automatic Control Engineering, McGraw Hill International.

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EC(EI)802C.1	3	2	2	1	1	-	-	-	-	-	2	1	2	2
EC(EI)802C.2	1	2	3	-	2	-	-	-	-	-	-	-	2	2
EC(EI)802C.3	2	-	2	-	1	-	-	-	-	-	-	-	2	2
EC(EI)802C.4	-	1	-	-	3	1	-	-	-	-	-	-	2	2

INSTRUMENTATION & CONTROL DESIGN LABORATORY
CODE: EI 891
CONTACT: 3P
CREDITS: 2

Course Outcome:

On completion of this course students will be able to:
EI 891.1:explain the LabVIEW software.
EI 891.2: explore the various programming techniques of LabVIEW software
EI 891.3:design different type of program based on data acquisition systems and control systems
EI 891.4: design the different real time applications using the concept of VI

Experiments:

1.Design and demonstrate general signal conditioning circuit to convert sensor output to 4-20 mA.
2.Design and fabrication of an instrument like
a.thermal conductivity analyser
b.piezo-electric accelerometer

3.Process Control Loop Design
a.Flow Control
b.Level Control

4.Design of a. amplifier
b. counters (high frequency)

5.Signal to data converter design including coding for different sampling rates.
6.Controller (digital) design (designing of processor i.e., program) for different process transfer function Including dead time (Smith Predictor)

7.Sensor design and Simulation: specified sensor only

CO-PO-PSO Mapping:(DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	P011	P012	PSO1	PSO2
EI 891.1	3	2	1	1	-	1	-	1	-	1	-	1	1	1
EI 891.2	2	1	3	3	2	1	-	-	1	-	-	1	1	1
EI 891.3	2	3	1	2	-	1	-	-	-	-	1	-	1	1
EI 891.4	1	3	-	3	-	1	1	-	-	1	-	-	1	1