R_2016

Curriculum Under Autonomy

Implemented from Academic Year 2016-2017

Syllabus

To be implemented from the Academic Year 2016

First Year First Semester

Sl No	Paper Code	Theory	Contact Hours /Week				Credit Points
			L	T	P	Total	
A. THEORY							
1	M 101	Mathematics -I	3	1	0	4	4
2	CH 101/ PH 101	Chemistry (Gr. A) / Physics - I(Gr. B)	3	1	0	4	4
3	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) / Basic Electronics Engineering (Gr. B)	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
B. PRACTICAL							
6	HU191	Lang. Lab. and Seminar Presentation	0	0	2	2	1
7	CH 191/ PH191	Chemistry Lab (Gr. A) / Physics -I Lab(Gr. B)	0	0	3	3	2
8	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) /Basic Electronics Engineering Lab(Gr. B)	0	0	3	3	2
9	ME 191/ ME 192	Engg Drawing & Graphics(Gr A)/ Workshop Practice (Gr-B)	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

First Year Second Semester

Sl No	Paper Code	Theory	Contact Hours /Week				Credit Points
A. THEORY							
			L	T	P	Total	
1	M 201	Mathematics -II	3	1	0	4	4
2	CH 201/ PH 201	Chemistry (Gr. B) / Physics - I(Gr. A)	3	1	0	4	4
3	EE 201/ EC 201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	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
B. PRACTICAL							
6	CS291	Computer Fundamentals & Principle of Computer Programming Lab	0	0	3	3	2
7	CH 291/ PH291	Chemistry Lab (Gr. B) / Physics -I Lab(Gr. A)	0	0	3	3	2
8	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) /Basic Electronics Engineering Lab(Gr. A)	0	0	3	3	2
9	ME 291/ ME 292	Engg Drawing & Graphics(Gr B)/ 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

Group A (ECE , EE , AEIE , BIOMEDICAL)		Group B (CSE , IT , FT ,ME,CE)	
1st Semester	**2nd Semester**	**1st Semester**	**2nd Semester**
Chemistry	Physics - I	Physics - I	Chemistry
Basic Electrical Engineering	Basic Electronics Engineering	Basic Electronics Engineering	Basic Electrical Engineering
Engg Drawing & Graphics	Workshop Practice	Workshop Practice	Engg Drawing & Graphics

Course Curriculum of B.Tech Electrical Engineering Programme

2nd Year, 3rd SEMESTER

Sl. No.		Code	Paper	Contact Periods/ week				Total Contact Hours	Credit
				L	T	P	S		
THEORY:									
1	BS	M 301	Mathematics III	3	1	-	-	4	4
2	PC	EC(EE)301	Digital Electronics	3	1	-	-	4	3
3	PC	EC(EE)302	Analog Electronic Circuits	3	0	-	-	3	3
4	PC	EE301	Circuits Theory And Networks	3	1	-	-	4	4
5	PC	EE 302	Field Theory	3	0	-	-	3	3
6	ES	ME(EE)301	Thermal Power Engineering	2	0	-	-	2	2
PRACTICAL:									
1	PC	EC(EE)391	Analog & Digital Electronics lab	-	-	3	-	3	2
2	PC	EE391	Circuit Theory and Network Lab	-	-	3	-	3	2
3	ES	ME(EE)391	Thermal Power Engineering Lab	-	-	2	-	2	1
4	HU	HU381	Technical Report Writing & Language Practice	-	-	2	-	2	1
	Total Theory							20	19
	Total Practical							10	06
	GRAND TOTAL							30	25

2nd Year, 4th SEMESTER

Note: Numerical Methods And Computer Programming Lab [CS(EE)491], & Technical Report Writing & Language Laboratory Practice [HU(EE)481] together, will be treated as one lab.

Sl. No.		Code	Paper	Contact Periods/ week				Total Contact Hours	Credit
				L	T	P	S		
THEORY:									
1	BS	PH (EE)401	Physics II	3	0	-	-	3	3
2	PC	EE 401	Electrical Machines I	3	1	-	-	4	4
3	PC	EE 402	Electrical and Electronics Measurement	3	0	-	-	3	3
4	BS	M(CS) 401	Numerical Methods	3	0	-	-	3	2
5	ES	CS(EE) 402	Data Structure	3	0	-	-	3	2
PRACTICAL:									
1	BS	PH(EE) 491	Physics II Lab	-	-	3	-	3	2
2	PC	EE491	Electrical Machines-I lab	-	-	3	-	3	2
3	PC	EE 492	Electrical and Electronics Measurement Lab.	-	-	3	-	3	2
4	BS	M(CS)491	Numerical Methods Lab	-	-	2	-	2	1
5	ES	CS(EE) 492	Data Structure Lab	-	-	2	-	2	1
SESSIONAL									
6	MC	MC481	Technical Skill Development	-	-	2	-	2	**0 (2 Units)**
	Total Theory							16	14
	Total Practical							15	08
	TOTAL							31	22

Course Curriculum of B.Tech Electrical Engineering Programme

3rd Year, 5th SEMESTER

Sl. No.		Code	Paper	Contact Periods Per Weeks				Total Contact Hours	Credit
				L	T	P	S		
THEORY:									
1	HS	HU501	Environmental Science	2	0	0	0	2	2
2	PC	EE501	Electrical Machines-II	3	1	-	-	4	4
3	PC	EE502	Power Systems-I	3	1	-	-	4	4
4	PC	EE503	Control Systems-I	3	1	-	-	4	4
5	PC	EE504	Microprocessor and Microcontroller	3	0	-	-	3	3
PRACTICAL:									
1	PC	EE591	Electrical Machines-II Lab	0	0	3	0	3	2
2	PC	EE592	Power Systems-I Lab	0	0	3	0	3	2
3	PC	EE593	Control System-I Lab	0	0	3	0	3	2
4	PC	EE594	Microprocessor and Microcontroller lab	0	0	3	0	3	2
5	PW	EE581	Electrical System Design-I	0	1	3	0	4	2
Sessional									
6	MC	MC 581	Group Discussion & Seminar	0	0	2	0	2	**0 (2 Units)**
	Total theory							17	17
	Total Practical & Sessional							18	10
	TOTAL							35	27

3rd Year, 6th SEMESTER

Sl. No.		Code	Paper	Contact Periods Per Weeks				Total Contact Hours	Credit
				L	T	P	S		
THEORY:									
1	PC	EE601	Control Systems-II	3	0	-	-	3	3
2	PC	EE602	Power Systems-II	3	0	-	-	3	3
3	PC	EE603	Power Electronics	3	0	-	-	3	3
4	PC	EC(EE)604	Digital Signal Processing*	3	0	0	0	3	3
5	PE	EE 605	Elective I a. Non-conventional Energy Sources and Applications b. Computational Intelligence c. Introduction to Robotics d. Mechatronics	3	1	0	0	4	4
6	OE	CS (EE)606	Elective-II a. Introduction to programming in JAVA b. Object oriented Programming using C++ c. Operating systems d. Software Engineering	3	0	0	-	3	3
PRACTICAL:									
1	PC	EE691	Control System-II Lab	0	0	3	0	3	2
2	PC	EE692	Power Systems-II Lab	0	0	3	0	3	2
3	PC	EE693	Power Electronics Lab	0	0	3	0	3	2
4	PW	EE 681	Electrical System Design –II	0	1	3	0	4	2
5	OE	CS (EE)606	Elective-II	0	0	2	0	2	1
6	PW	EE 671	Industrial Training					4 week	2
		Total Theory						19	19
		Total Practical/ Sessional						15	11
		TOTAL						34	30

*** As per recommendations of External Expert, the course has been changed from PE to PC.**

4rd Year, 7th SEMESTER

Sl. No.		Code	Paper	Contact Periods Per Weeks				Total Contact Hours	Credit
				L	T	P	S		
1	PC	EE 701	Electric Drives	3	0	-	-	3	3
2	PE	EE 702	Elective III a. Utilization of Electric Power b. Advanced Power Electronics c. Illumination Engineering	3	1	0	-	4	4
3	PE	EE703	Elective-IV a. Advanced Power Systems b. Power generation and economics c. High Voltage engineering d. Advanced Electrical Measurement & Instrumentation	3	1	0	-	4	4
4	OE	CS(EE)705	Elective V a. Artificial intelligence and soft computing b. Digital image processing c. Computer Networking d. Data Base Management System	3	0	-	-	3	3
5	HS	HU702	Values and Ethics in Profession	2	0	-	-	2	2
PRACTICAL:									
1	PC	EE791	Electric Drives lab	0	0	3	0	3	2
2	OE	EE795	Elective V lab	0	0	2	0	2	1
3	PW	EE781	Assigned Project -I	0	0	6	0	6	3
4	PW	EE771	Seminar on Industrial Training and Report	0	0	0	0	0	1
5	PW	MC781	Entrepreneurship Development	0	0	0	0	2	0 (2 units)
		Total Theory						16	16
		Total Practical						13	07
		TOTAL						**29**	**23**

4th Year, 8th SEMESTER

Sl. No.		Code	Paper	Contact Periods Per Weeks				Total Contact Hours	Credit
				L	T	P	S		
1	PE	EE 801	Elective VI a. HVDC Transmission b. Energy Management and Audit c. Power Plant Engineering	3	1	0	0	4	4
2	PE	EE 802	Elective VII a. Sensors & Transducers b. Process control and instrumentation c. Electronic Instrumentation & Control.	3	0	0	0	3	3
3	HS	HU805	Industrial and Financial Management	2	0	0	0	2	2
4	PW	EE881	Project & Thesis	0	0	12	0	12	6
5	PW	EE871	Grand Viva	0	0	0	0	0	3
	TOTAL							**21**	**18**

EE Curriculum Credit Details

Subject Area	**Year wise Break up of credits**				**Total:198**		**AICTE**
	1st year	2nd year	3rd year	4th year	Credits	Credits in %	**norms**
BS	20	12	0	0	32	16.08	(10-20)%
ES	30	06	0	0	36	18.27	(15-20)%
HS	03	01	02	04	10	5.08	(5-10)%
PC	0	28	41	05	74	37.19	(30-40)%
PE	0	0	04	15	19	9.64	(10-15)%
OE	0	0	04	04	08	4.06	(5-10)%
PW	0	0	06	13	19	10.15	(10-15)%
Total	**54**	**51**	**53**	**40**	**198**		

First Year First Semester

Group A: ECE, EE, BME, AEIE/EIE

Group B: CSE, IT, FT, ME, CE

Curriculum:

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/ PH 101	Chemistry (Gr. A) / Physics - I(Gr. B)	3	1	0	4	4
3	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) / Basic Electronics Engineering (Gr. B)	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/ PH191	Chemistry Lab (Gr. A) / Physics -I Lab(Gr. B)	0	0	3	3	2
8	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) /Basic Electronics Engineering Lab(Gr. B)	0	0	3	3	2

9	ME 191/ME 192	Engineering Drawing & Graphics(Gr A)/ Workshop Practice (Gr-B)	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:

Theory

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.

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 3rd 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:

E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley, 1999.

B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.

R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, 2008.

H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley, 1995.

G. Strang, Linear algebra and its applications (4th Edition), Thomson, 2006.

Reference Books:

S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India, 2000.

M. Apostol, Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.

TG. B. Thomas and R. L. Finney, Calculus and Analytic Geometry (9th Edition), ISE Reprint, Addison-Wesley, 1998.

Hughes-Hallett et al., Calculus - Single and Multivariable (3rd Edition), John-Wiley and Sons, 2003.

J. Stewart, Calculus (5th Edition), Thomson, 2003.

J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier,2006.

L.Rade and B.Westergen, Mathematics Handbook: for Science and Engineering (5th edition, 1st Indian Edition), Springer, 2009.

Murray R Spiegel and Seymour Lipschutz, Schaum's Outline of Vector Analysis.

Richard Bronson , Schaum's Outline of Matrix Operations.

CO-PO mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
M 101.1	3	2	-	-	-	-	-	-	-	-	-	1
M 101.2	3	2	-	-	-	-	-	-	-	-	-	1
M 101.3	3	2	2	-	-	-	-	-	-	-	-	1

FOR GROUP A: EE, ECE, EIE/AEIE, BME

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 apply fundamental concepts of thermodynamics in different engineering applications.

CH101.2: Able to analyze & design simple and technologically advanced electrical and energy storage devices.

CH101.3: Able to synthesize nanomaterials, composites, polymers.

CH101.4: Able to apply the basic concept of Organic Chemistry and knowledge of chemical reactions to industries , and technical fields.

CH101.5: Able to apply the knowledge of different fuels and corrosion to different industries

CH101.6: Able to analyse water quality parameter for its various parameters & its significance in industries.

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

Engineering Chemistry: Bandyopadhyay and Hazra

Physical Chemistry: P.C. Rakshit

Organic Chemistry: Finar, vol-1

Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008

A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.

Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CH101.1	3	1	-	-	-	-	-	-	-	-	-	-
CH101.2	3	2	1	-	-	-	-	-	-	-	-	-
CH101.3	-	-	2	-	2	-	-	-	-	-	-	1
CH101.4	2	-	1	-	2	-	-	-	-	-	-	-
CH101.5	2	-	-	-	-	-	2	-	-	-	-	1
CH101.6	-	-	2	-	-	-	1	-	-	-	-	-

FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: Physics -I

Paper Code: PH 101

Total Contact Hours: 41

Credit: 4

Pre requisites: Knowledge of Physics upto 12th 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 101.1 : Ability to state and recall De-Broglie hypothesis, and Heisenberg's Uncertainty Principle Amplitude and Velocity Resonance Malus's Law, Brewster's Law Characteristics of LASER light	PO1 Or GA1
PH 101.2 : Ability to understand and explain Polarizer and analyzer basic principles and different types of LASER and Optical Fibre structure of solids, Miller indices theory of Matter Wave, equation of motion of Matter Wave wave function and its role in representing wave nature of matter	PO2 Or GA2
PH 101. 3 : Ability to apply the knowledge of mechanical vibration in electrical circuits superposition principle in Newton's ring phenomenon, diffraction phenomenon quantum nature of e.m. waves for production of laser total internal reflection in transmitting light through optical fibres x-ray diffraction in crystal structure probability interpretation in Heisenberg's uncertainty principle	PO3 Or GA3
PH 101.4 : Ability to analyze grating as many slit system role of Q factor in a resonating circuit, conditions of different types of resonance minimum requirements for lasing action importance of light as a carrier of information	PO2 Or GA2

the failures of classical physics in microscopic situation and need of quantum physics Einstein's A, B coefficient and predict the wavelength domain of Lasing action Requirement of Miller indices for describing crystallographic planes	
PH 101.5 : Ability to evaluate / justify / compare X-ray production process is inverse of the process of Photoelectric Effect. different crystallographic structures according to their Co-ordination number and packing factors the outcome of Photo-electric effect, Compton effect and Davission-Germer experiment to justify wave-particle duality of matter	PO12 Or GA12

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, plane 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:

13. A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)

14. A text book of Light-Brijlal & Subhramanium, (S. Chand publishers)

15. Modern Optics-A. B. Gupta (Book & Allied Publisher)

16. Optics-Ajay Ghatak (TMH)

17. Optics-Hecht

18. Optics-R. Kar, Books Applied Publishers

19. Möler (Physical Optics)

20. E. Hecht (Optics)

21. E. Hecht (Schaum Series)

22. F.A. Jenkins and H.E White

23. C.R. Dasgupta (Degree Physics Vol 3)

Quantum Physics

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

25. Quantum Mechanics-Bagde Singh (S. Chand Publishers)

26. Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)

27. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)

28. Quantum Mechanics-Bransden (Pearson Education Ltd.)

29. Perspective of Modern Physics-A. Beiser (TMH)

30. Eisberg & Resnick is published by Wiley India

31. A.K. Ghatak and S Lokenathan

32. E.E. Anderson (Modern Physics)

33 .Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India

34. Binayak Dutta Roy [Elements of Quantum Mechanics]

X-ray & Crystallography

35. Solid state physics-Puri & Babbar (S. Chand publishers)

36. Materials Science & Engineering-Kakani Kakani

37. Solid state physics- S. O. Pillai

38. Introduction to solid state physics-Kittel (TMH)

39. Solid State Physics and Electronics-A. B. Gupta, Nurul Islam (Book & Allied Publisher)

40. 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)

4. University Physics-Sears & Zemansky (Addison-Wesley)

5.B. Dutta Roy (Basic Physics)

6. R.K. Kar (Engineering Physics)

7. Mani and Meheta (Modern Physics)

8. Arthur Baiser (Perspective & Concept of Modern Physics)

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH 101.1	1											
PH 101.2		2										
PH 101.3	3											
PH 101.4		1										
PH 101.5												1

FOR GROUP A: EE, ECE, EIE/AEIE, BME

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: To understand and analyse basic electric and magnetic circuits.

EE 101.2: To understand and analysis the AC single phase and three phase circuit

EE101.3: To understand and analysis of the basic principles of various electrical 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

V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.

Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication

Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH

C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books

H. Cotton, Willey Press

J.B. Gupta, Basic Electrical Engineering, Kataria & Sons .

Kothari & Nagrath, Basic Electrical Engineering, TMH

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE101.1	3	3	2	1								
EE101.2	2	2	1									
EE101.3	3	2	2									

FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: Basic Electronics Engineering

Paper code: EC101

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 101.1	Study PN junction diode, ideal diode, diode models and its circuit analysis, application of diodes and special diodes.
EC 101.2	Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation on electronic signals.
EC 101.3	Study the concepts of both positive and negative feedback in electronic circuits.
EC 101.4	Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis.
EC 101.5	Learn how the primitives of Boolean algebra are used to describe the processing of binary signals.

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 (IDC , Irms , VDc , Vrms) , 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:

D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International

Millman & Halkias, Integrated Electronics, Tata McGraw Hill.

Boyelstad & Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.

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 Mapping

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EC 101.1	3	-	-	-	-	-	-	-	-	-	-	-
EC 101.2	2	3	-	-	-	-	-	-	-	-	-	1
EC 101.3	1	3	-	-	-	-	-	-	-	-	-	-

EC 101.4	1	2	3	-	-	-	-	-	-	-	-	1
EC 101.5	3	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:

At the end of this course, students will be

HU101.1: Able to comprehend and communicate in English through exposure to communication skills theory and practice.

HU101.2: Apply the basic grammatical skills of the English language through intensive practice.

HU101.3: Able to develop reading and comprehension skills.

HU101.4: Able to develop writing proficiency skills by writing Official Letters, Technical report, memo, notice, minutes, agenda, resume, curriculum vitae.

HU101.5: Able to apply/illustrate all sets of English language and communication skills in creative and effective ways in the professional sphere of their life

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

b. Process of Communication—Models and Types

c. Verbal—Non-Verbal Communication, Channels of Communication

d. 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

d. Reading Sub-Skills—Skimming, Scanning, Intensive Reading

e. 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.

f. Precis Writing

(Use of daily newspapers for reading practice is recommended)

Module 3: Functional Grammar and Usage [6L]

a. Articles, Prepositions, Verbs

b. Verb-Subject Agreement

c. Comparison of Adjectives

d. Tenses and their Use

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

f. 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 Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HU101.1	-	-	1	-	-	1	-	1	3	3	3	3
HU 101.2	-	-	-	-	-	2	-	-	2	3	3	3
HU 101.3	-	3	2	2	-	3	2	2	3	3	3	3
HU 101.4	-	-	-	2	-	2	-	-	3	3	2	3
HU 101.5	-	2	1	-	-	2	2	1	3	3	2	3

Paper Name: Engineering Mechanics

Paper Code: ME101

Total Contacts Hours: 45

Credit: 4

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

Course Objective:

1. Understand the vector and scalar representation of forces and moments.

2. Describe static equilibrium of particles and rigid bodies in two dimensions and three dimensions including the effect of Friction

3. Analyze the properties of surfaces & solids in relation to moment of inertia.

4. Illustrate the laws of motion, kinematics of motion and their interrelationship.

5. 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:

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

Principle of virtual work with simple application. 1L+1T

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

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

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

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

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

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

Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.

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

CO-PO Mapping:

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

Practical

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

c. Conversational Role Plays (including Telephonic Conversation)

d. 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-Mapping:

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

FOR GROUP A: EE, ECE, EIE/AEIE, BME

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 heterogenous medium. Understanding the basic principles of pH meter and conductivity meter for different applications and analyzing water for its various parameters. Synthesis of Polymeric materials and Nanomaterials.

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 an 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).

7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.

8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.

9. Determination of dissolved oxygen present in a given water sample.

10. 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 Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CH191.1	3	2	1	1	1	1	-	-	2	-	-	-
CH191.2	-	-	-	-	-	-	-	-	3	-	-	-
CH191.3	-	-	-	-	-	2	3	-	-	-	-	1
CH191.4	-	-	-	-	2	1	-	-	-	-	-	-

CH191.5	2	-	2	-	1	-	-	-	-	-	-	1

FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: Physics I Lab

Paper Code: PH 191

Total Contact Hours: 40

Credit: 4

Pre requisites: Knowledge of Physics upto 12th standard.

Course Outcome of Physics-I practical (PH 191)

At the end of the course students' should have the

PH 191.1 : Ability to define, understand and explain Error estimation, Proportional error calculation superposition principle in Newton's ring, Fresnel's biprism, laser diffraction Basic circuit analysis in LCR circuits	PO1
PH 191.2 : Ability to conduct experiments using LASER, Optical fibre Interference by division of wave front, division of amplitude, diffraction grating, polarization of light Quantization of electronic energy inside an atom Torsional pendulum	PO4
PH 191.3 : Ability to participate as an individual, and as a member or leader in groups in	PO9

laboratory sessions actively	
PH 191.4 : Ability to analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments	PO10

General idea about Measurements and Errors (One Mandatory):

i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.

ii) 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:

5. Determination of wavelength of light by Newton's ring method.

6. Determination of wavelength of light by Laser diffraction method.

7. Determination of numerical aperture and the energy losses related to optical fiber experiment

8. Measurement of specific rotation of an optically active solution by polarimeter.

Experiments on Quantum Physics:

11. Determination of Planck's constant using photoelectric cell.

12. 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.
6. Any other experiment related to the theory.

CO-PO Mapping:

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

FOR GROUP A: EE, ECE, EIE/AEIE, BME

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:

COs	CO Statement
EE191.1	Identify common electrical components and their ratings.
EE191.2	Make Circuit connection by wires of appropriate ratings.
EE191.3	Understand the usage of common electrical measuring instruments
EE191.4	Understand the basic characteristics of transformers and electrical machines

Course contents

LIST OF EXPERIMENTS

Characteristics of Fluorescent ,Tungsten and Carbon filament lamps

Verification of Thevenin's and Norton's Theorem

Verification of Superposition Theorem

Calibration of Ammeter and Wattmeter

Study of R-L-C series circuit

Open circuit and short circuit test of a single phase Transformer

Starting, Reversing of a and speed control of D.C shunt motor

Test on single phase Energy Meter

Familiarization of PMMC and MI type Meter

Familiarization with house wiring practice

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE191.1	2	3		1	3				1		2	1
EE191.2	2		2	1	3				1	1		
EE191.3		3				3	2				2	1
EE191.4	3						1			2	2	2

FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: Basic Electronics Engineering Lab

Paper Code: EC191

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:

EC191.1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.
EC191.2	Analyze the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.
EC191.3	Determination of input-offset voltage, input bias current and Slew rate, Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
EC191.4	Able to know the application of Diode, BJT &OPAMP.
EC191.5	Familiarization and basic knowledge of Integrated Circuits

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.

13. Innovative Experiment

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EC 191.1	3	3	-	-	-	-	-	-	-	-	-	-
EC 191.2	2	3	-	-	-	-	-	-	1	1	-	1
EC 191.3	1	3	3	-	-	-	-	-	-	2	-	-
EC 191.4	1	2	3	-	-	-	-	-	-	1	-	1
EC 191.5	3	1	2	-	-	-	-	-	-	-	-	-

FOR GROUP A: EE, ECE, EIE/AEIE, BME

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:

ME 191.1. 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

6. 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 Codes	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
ME 191.1	2	-	1	2	-	1	-	-	1	-	-	1
ME 191.2	3	-	2	2	-	1	-	-	1	1	-	1
ME 191.3	2	2	2	1	-	1	-	-	1	-	-	1
ME 191.4	1	-	2	2	2	1	-	-	1	1	-	1

FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: Workshop Practice

Paper Code: ME192

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:

ME192.1 Gain basic knowledge of Workshop Practice and Safety useful for our daily living.

ME192.2 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.

ME192.3 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.

ME192. 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.

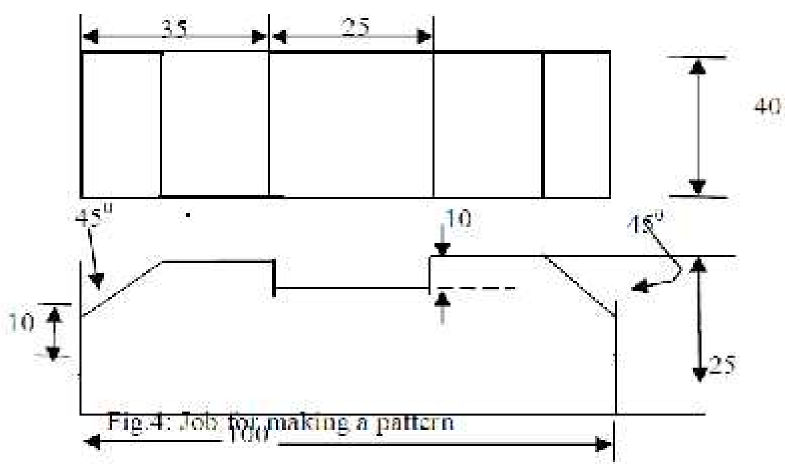
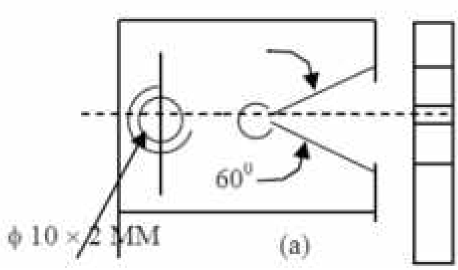
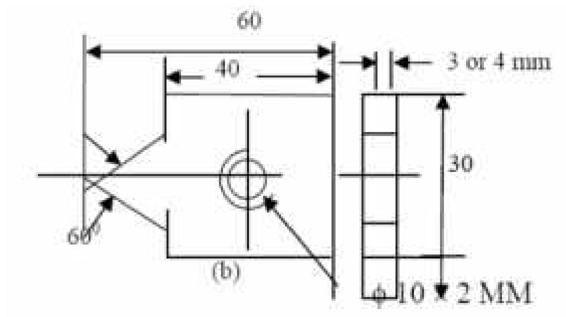


Fig.4: Job for making a pattern

MODULE 3- FITTING SHOP.





OR

MODULE 4 – MACHINING IN LATHE & SHAPING M/C

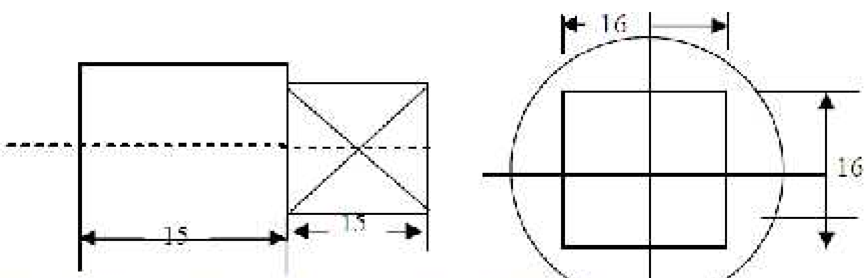
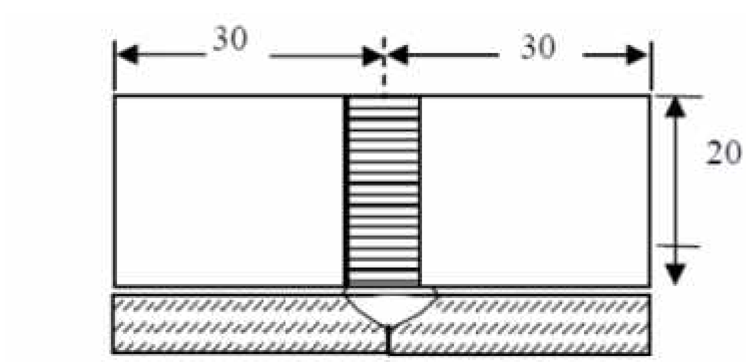


Fig.3: Job for practice on a shaping and/or milling machine

MODULE 5 – WELDING



CO-PO Mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME 192.1	2	-	-	-	-	2	-	1	-	-	1	-
ME 192.2	2	-	-	-	-	1	-	2	-	-	-	-
ME 192.3	2	-	-	-	-	1	-	1	-	-	-	-
ME 192.4	1	-	-	-	1	3	-	3	-	-	-	1

Sessional

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:

a) Creating awareness in social issues

b) Participating in mass education programmes

c) Proposal for local slum area development

d) Waste disposal

e) Environmental awareness ``

f) Production Oriented Programmes

g) 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;

9. Work for the promotion and strengthening of cooperative societies in villages;

10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;

11. Popularization of small savings and

12. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities

g) Assisting the authorities in distribution of rations, medicine, clothes etc.;

h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;

i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;

j) 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

Group A: ECE, EE, BME, AEIE/EIE

Group B: CSE, IT, FT, ME, CE

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	CH 201/ PH 201	Chemistry (Gr. B) / Physics - I(Gr. A)	3	1	0	4	4
3	EE 201/ EC 201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	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	CH 291/	Chemistry Lab (Gr. B) /	0	0	3	3	2

	PH291	Physics -I Lab(Gr. A)					
8	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) /Basic Electronics Engineering Lab(Gr. A)	0	0	3	3	2
9	ME 291/ME 292	Engg Drawing & Graphics(Gr B)/ 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

Syllabus

Theory

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.

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:

E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley, 1999.

B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.

R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, 2008.

ReferenceText Books:

W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley, 2005.

R.K. Ghosh and K.C.Maity, An Introduction to Differential Equations, New Central Book Agency.

V. K. Balakrishnan,Graph Theory, Schaum’s Outline, TMH.

J. Clark and D. A. Holton, A first course at Graph Theory,Allied Publishers LTD.

D. B. West, Introduction to Graph Theory,Prentice-Hall of India.

N. Deo, Graph Theory, Prentice-Hall of India.

J. Bird, Higher Engineering Mathematics (4th Edition, 1st India Reprint), Elsevier, 2006.

L. Rade and B. Westergen, Mathematics Handbook: for Science and Engineering (5th edition, 1st Indian Edition), Springer, 2009.

Murray R.Spiegel, Laplace Transform, Schaum’s Outline Series, McGRAW-HILL.

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
M 201.1	3	2	-	-	-	-	-	-	-	-	-	1
M 201.2	3	2	-	-	-	-	-	-	-	-	-	1
M 201.3	3	2	2	-	-	-	-	-	-	-	-	1

FOR GROUP B: ME, CE, IT, CSE, FT

Paper Name: Chemistry

Paper Code: CH 201

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

CH201.1: Able to apply fundamental concepts of thermodynamics in different engineering applications.

CH201.2: Able to analyze & design simple and technologically advanced electrical and energy storage devices.

CH201.3: Able to synthesize nanomaterials, composites, polymers.

CH201.4: Able to apply the basic concept of Organic Chemistry and knowledge of chemical reactions to industries , and technical fields.

CH201.5: Able to apply the knowledge of different fuels and corrosion to different industries

CH201.6: Able to analyse water quality parameter for its various parameters & its significance in industries.

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

Engineering Chemistry: Bandyopadhyay and Hazra

Physical Chemistry: P.C. Rakshit

Organic Chemistry: Finar, vol-1

Engineering Chemistry: B.Sivasankar, Tata Mc Graw Hill, 2008

A Text book of Engineering Chemistry: S.S.Dara, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.

Engineering Chemistry Simplified: S. Nandi and R. Bhattacharyya, Chayya Prakashani Pvt. Ltd.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CH201.1	3	1	-	-	-	-	-	-	-	-	-	-
CH201.2	3	2	1	-	-	-	-	-	-	-	-	-
CH201.3	-	-	2	-	2	-	-	-	-	-	-	1
CH201.4	2	-	1	-	2	-	-	-	-	-	-	-
CH201.5	2	-	-	-	-	-	2	-	-	-	-	1
CH201.6	-	-	2	-	-	-	1	-	-	-	-	-

FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Physics -I

Paper Code: PH 201

Total Contact Hours: 41

Credit: 4

Pre requisites: Knowledge of Physics upto 12th 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 : Ability to state and recall De-Broglie hypothesis, and Heisenberg's Uncertainty Principle Amplitude and Velocity Resonance Malus's Law, Brewster's Law Characteristics of LASER light	PO1 Or GA1
PH 201.2 : Ability to understand and explain Polarizer and analyzer basic principles and different types of LASER and Optical Fibre structure of solids, Miller indices theory of Matter Wave, equation of motion of Matter Wave wave function and its role in representing wave nature of matter	PO2 Or GA2
PH 201. 3 : Ability to apply the knowledge of mechanical vibration in electrical circuits superposition principle in Newton's ring phenomenon, diffraction phenomenon	PO3 Or GA3

quantum nature of e.m. waves for production of laser total internal reflection in transmitting light through optical fibres x-ray diffraction in crystal structure probability interpretation in Heisenberg's uncertainty principle	
PH 201.4 : Ability to analyze grating as many slit system role of Q factor in a resonating circuit, conditions of different types of resonance minimum requirements for lasing action importance of light as a carrier of information the failures of classical physics in microscopic situation and need of quantum physics Einstein's A, B coefficient and predict the wavelength domain of Lasing action Requirement of Miller indices for describing crystallographic planes	PO2 Or GA2
PH 201.5 : Ability to evaluate / justify / compare X-ray production process is inverse of the process of Photoelectric Effect. different crystallographic structures according to their Co-ordination number and packing factors the outcome of Photo-electric effect, Compton effect and Davission-Germer experiment to justify wave-particle duality of matter	PO12 Or GA12

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, plane 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:

13. A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)

14. A text book of Light-Brijlal & Subhramanium, (S. Chand publishers)

15. Modern Optics-A. B. Gupta (Book & Allied Publisher)

16. Optics-Ajay Ghatak (TMH)

17. Optics-Hecht

18. Optics-R. Kar, Books Applied Publishers

19. Möler (Physical Optics)

20. E. Hecht (Optics)

21. E. Hecht (Schaum Series)

22. F.A. Jenkins and H.E White

23. C.R. Dasgupta (Degree Physics Vol 3)

Quantum Physics

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

25. Quantum Mechanics-Bagde Singh (S. Chand Publishers)

26. Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)

27. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)

28. Quantum Mechanics-Bransden (Pearson Education Ltd.)

29. Perspective of Modern Physics-A. Beiser (TMH)

30. Eisberg & Resnick is published by Wiley India

31. A.K. Ghatak and S Lokenathan

32. E.E. Anderson (Modern Physics)

33 .Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India

34. Binayak Dutta Roy [Elements of Quantum Mechanics]

X-ray & Crystallography

35. Solid state physics-Puri & Babbar (S. Chand publishers)

36. Materials Science & Engineering-Kakani Kakani

37. Solid state physics- S. O. Pillai

38. Introduction to solid state physics-Kittel (TMH)

39. Solid State Physics and Electronics-A. B. Gupta, Nurul Islam (Book & Allied Publisher)

40. 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)

4. University Physics-Sears & Zemansky (Addison-Wesley)

5.B. Dutta Roy (Basic Physics)

6. R.K. Kar (Engineering Physics)

7. Mani and Meheta (Modern Physics)

8. Arthur Baiser (Perspective & Concept of Modern Physics)

CO-PO Mapping:

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

FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: Basic Electrical Engineering

Paper Code: EE 201

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 201.1: To understand and analyse basic electric and magnetic circuits.

EE 201.2: To understand and analysis the AC single phase and three phase circuit

EE 201.3: To understand and analysis of the basic principles of various electrical 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

V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.

Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication

Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH

C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books

H. Cotton, Willey Press

J.B. Gupta, Basic Electrical Engineering, Kataria & Sons .

Kothari & Nagrath, Basic Electrical Engineering, TMH

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE 201.1	3	3	2	1								
EE 201.2	2	2	1									
EE 201.3	3	2	2									

FOR GROUP A: EE, ECE, EIE/AEIE, BME

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	Study PN junction diode, ideal diode, diode models and its circuit analysis, application of diodes and special diodes.
EC 201.2	Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation on electronic signals.

EC 201.3	Study the concepts of both positive and negative feedback in electronic circuits.
EC 201.4	Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis.
EC 201.5	Learn how the primitives of Boolean algebra are used to describe the processing of binary signals.

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 (IDC , Irms , VDc , Vrms) , 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:

D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International

Millman & Halkias, Integrated Electronics, Tata McGraw Hill.

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 Mapping

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EC 201.1	3	-	-	-	-	-	-	-	-	-	-	-
EC 201.2	2	3	-	-	-	-	-	-	-	-	-	1
EC 201.3	1	3	-	-	-	-	-	-	-	-	-	-
EC 201.4	1	2	3	-	-	-	-	-	-	-	-	1
EC 201.5	3	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:

Kerninghan B.W. & Ritchie D.M. - The C Programming Language

Gottfried - Programming with C Schaum

Kanetkar Y. - Let us C

Balaguruswamy - Programming in C

Recommended reference Books:

Pohl and Kelly - A Book on C

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

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

Rajaraman V. Fundamental of Computers

M.M.Oka Computer Fundamentals,EPH

Leon Introduction to Computers,Vikas

Leon- Fundamental of Information Technology,Vikas

Ram B. Computer Fundamentals, New Age International

Ravichandran D. Programming in C, New Age International

Xavier C. Introduction to Computers, New Age International

CO-PO Mapping:

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

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:

1 Engineering Thermodynamics - P K Nag, 4th edn, TMH.

References:

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

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

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

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

Fluid Mechanics

Text:

Fluid Mechanics and Hydraulic Machines - R Bansal

References:

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

Fluid Mechanics by A.K.Jain.

CO-PO Mapping:

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

Practical

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:

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.

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

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

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

Writing C Programs demonstrating concept of Single & Multidimensional arrays.

Writing C Programs demonstrating concept of Function and Recursion.

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

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

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

Writing C Programs demonstrating concept of dynamic memory allocation.

Writing C Programs demonstrating concept of File Programming.

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

FOR GROUP B: ME, CE, IT, CSE, FT

Paper Name: Chemistry Lab

Paper Code: CH 291

Total Contact Hours: 36

Credit: 2

Pre requisites: 10+2 science with chemistry

Course Objective

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

Course Outcome

CH291.1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.

CH291.2: Able to work as an individual also as an team member

CH291.3: Able to analyse different parameters of water considering environmental issues

CH291.4: Able to synthesize nano and polymer materials.

CH291.5: 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).

7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.

8. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.

9. Determination of dissolved oxygen present in a given water sample.

10. 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 Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CH 291.1	3	2	1	1	1	1	-	-	2	-	-	-
CH 291.2	-	-	-	-	-	-	-	-	3	-	-	-
CH 291.3	-	-	-	-	-	2	3	-	-	-	-	1
CH 291.4	-	-	-	-	2	1	-	-	-	-	-	-
CH 291.5	2	-	2	-	1	-	-	-	-	-	-	1

FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Physics I Lab

Paper Code: PH 291

Total Contact Hours: 40

Credit: 4

Pre requisites: Knowledge of Physics upto 12th standard.

Course Outcome of Physics-I practical (PH 191)

At the end of the course students' should have the

PH 291.1 : Ability to define, understand and explain	PO1

Error estimation, Proportional error calculation superposition principle in Newton's ring, Fresnel's biprism, laser diffraction Basic circuit analysis in LCR circuits	
PH 291.2 : Ability to conduct experiments using LASER, Optical fibre Interference by division of wave front, division of amplitude, diffraction grating, polarization of light Quantization of electronic energy inside an atom Torsional pendulum	PO4
PH 291.3 : Ability to participate as an individual, and as a member or leader in groups in laboratory sessions actively	PO9
PH 291.4 : Ability to analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments	PO10

General idea about Measurements and Errors (One Mandatory):

i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.

ii) 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:

5. Determination of wavelength of light by Newton's ring method.

6. Determination of wavelength of light by Laser diffraction method.

7. Determination of numerical aperture and the energy losses related to optical fiber experiment

8. Measurement of specific rotation of an optically active solution by polarimeter.

Experiments on Quantum Physics:

11. Determination of Planck’s constant using photoelectric cell.

12. 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.

6. Any other experiment related to the theory.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH 291.1	2											
PH 291.2	1											

PH 291.3				2								
PH 291.4									3			

FOR GROUP B: ME, CE, IT, CSE, FT

Paper Name: Basic Electrical Engineering LAB

Paper Code: EE 291

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:

COs	CO Statement
EE 291.1	Identify common electrical components and their ratings.
EE 291.2	Make Circuit connection by wires of appropriate ratings.
EE 291.3	Understand the usage of common electrical measuring instruments
EE 291.4	Understand the basic characteristics of transformers and electrical machines

Course contents

LIST OF EXPERIMENTS

Characteristics of Fluorescent ,Tungsten and Carbon filament lamps

Verification of Thevenin's and Norton's Theorem

Verification of Superposition Theorem

Calibration of Ammeter and Wattmeter

Study of R-L-C series circuit

Open circuit and short circuit test of a single phase Transformer

Starting, Reversing of a and speed control of D.C shunt motor

Test on single phase Energy Meter

Familiarization of PMMC and MI type Meter

Familiarization with house wiring practice

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE 291.1	2	3		1	3				1		2	1
EE 291.2	2		2	1	3				1	1		
EE 291.3		3				3	2				2	1
EE 291.4	3						1			2	2	2

FOR GROUP A: EE, ECE, EIE/AEIE, BME

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.
EC291.5	Familiarization and basic knowledge of Integrated Circuits

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.

13. Innovative Experiment

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EC 291.1	3	3	-	-	-	-	-	-	-	-	-	-
EC 291.2	2	3	-	-	-	-	-	-	1	1	-	1
EC 291.3	1	3	3	-	-	-	-	-	-	2	-	-
EC 291.4	1	2	3	-	-	-	-	-	-	1	-	1
EC 291.5	3	1	2	-	-	-	-	-	-	-	-	-

FOR GROUP B: ME, CE, IT, CSE, FT

Paper Name: Engineering Drawing & Graphics

Paper Code: ME 291

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:

ME 291.1. Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.

ME 291.2. Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.

ME 291.3. Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.

ME 291.4. 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

6. 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 Codes	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
ME 291.1	2	-	1	2	-	1	-	-	1	-	-	1
ME 291.2	3	-	2	2	-	1	-	-	1	1	-	1
ME 291.3	2	2	2	1	-	1	-	-	1	-	-	1
ME 291.4	1	-	2	2	2	1	-	-	1	1	-	1

FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Workshop Practice

Paper Code: ME 292

Total Contact Hours: 36

Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:

1. To understand the basic knowledge of Workshop Practice and Safety.

2. 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.

3. 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:

ME 291.1 Gain basic knowledge of Workshop Practice and Safety useful for our daily living.

ME 291.2 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.

ME 291.3 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.

ME 291.4 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.

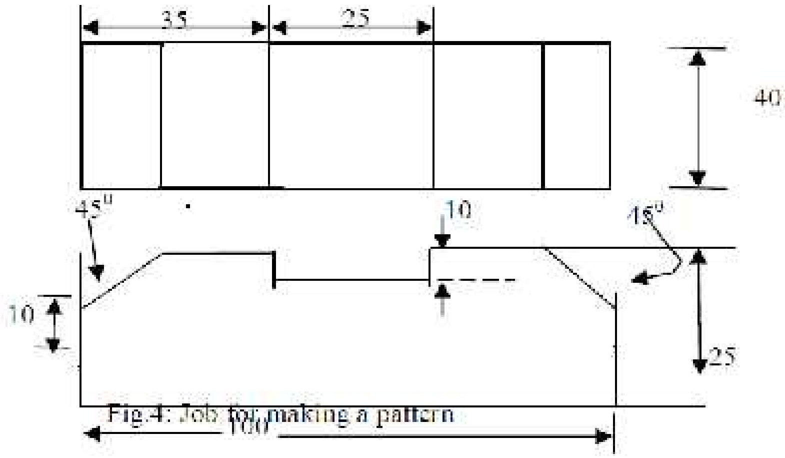
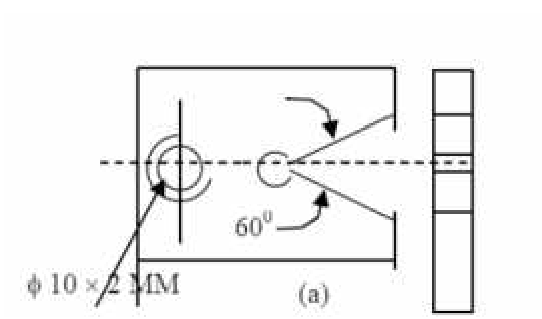
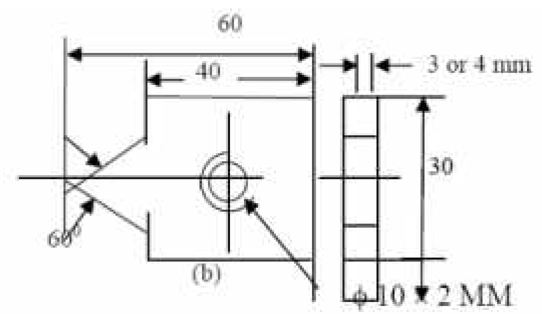


Fig.4: Job for making a pattern

MODULE 3- FITTING SHOP.



OR



MODULE 4 – MACHINING IN LATHE & SHAPING M/C

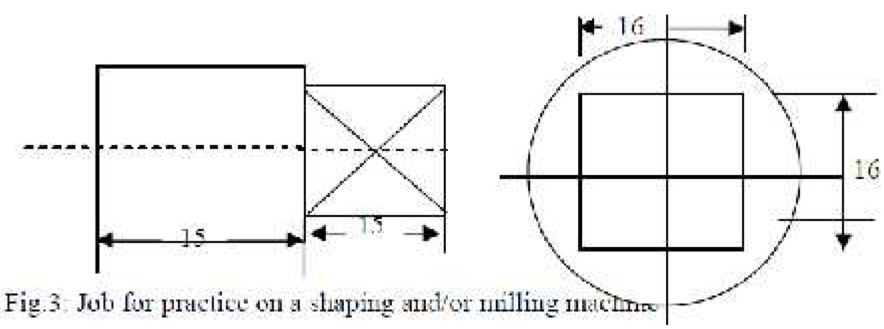
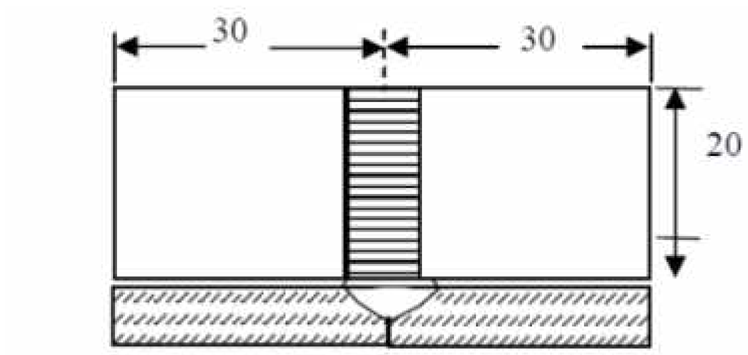


Fig.3: Job for practice on a shaping and/or milling machine

MODULE 5 – WELDING



CO-PO Mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME 292.1	2	-	-	-	-	2	-	1	-	-	1	-
ME 292.2	2	-	-	-	-	1	-	2	-	-	-	-
ME 292.3	2	-	-	-	-	1	-	1	-	-	-	-
ME 292.4	1	-	-	-	1	3	-	3	-	-	-	1

SESSIONAL

Paper Name: Soft Skills Development

Paper Code: MC-281

Total Contact hours: 26

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)

1. Organisational Communication and Structure.

2. Vocabulary related to Corporate Operation.

3. Modes of Communication (Telephone, Conference Call, Team Huddle, Public Relation etc.

4. Communication with Clients, Customers, Suppliers etc.

5. Verbal and Non-Verbal Communication, Proxemics and Para Language.

6. Vocabulary Building (Synonym / Antonym / One word Substitution etc.)

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

7. Mother Tongue Influence

8. Vowel Sounds and Consonantal Sounds

9. Pronunciation and Neutral Accent.

10. Intonation.

11. Rate of Speech, Pausing, Pitch Variation and Tone.

MODULE THREE – BUSINESS ETIQUETTE (2L)

12. Presenting oneself in the Business Environment.

13. Corporate Dressing and Mannerism.

14. Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
15. Multi Cultural Etiquette.
16. Cultural Difference.
17. E-mail Etiquette.

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

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

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

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

MODULE SIX – GROUP DISCUSSION (2L)

27. Introduction, Definition and Purpose.
28. Types of Group Discussion.
29. Strategies and Protocols of Group Discussion.
30. Skills and Parameters of Evaluation.

31. Practice Session and Video Viewing Task.

MODULE SEVEN – LEADERSHIP SKILL (2L)

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

MODULE EIGHT – TEAM WORK (2L)

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

MODULE NINE – PUBLIC SPEAKING AND INTERVIEW BASICS (2L)

42. Extempore.
43. JAM.
44. Interview Skill
45. Interview over Telephone, Video Conference Interview etc.

MODULE TEN – BUSINESS TELEPHONE ETIQUETTE (2L)

46. Five Phases of a Business Call.
47. Pitch, inflection, Courtesy and Tone.
48. Understanding, Rate of Speech, Enunciation.
49. Hold Procedure.
50. Cold and Hot Transfer protocols.
51. Dealing with Different Types of Customers (Irate, Talkative, Turnaround etc.)

MODULE ELEVEN- READING SKILL

52. 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.

Autonomy Curriculum and Syllabus of B.Tech Programme

Implemented from the Academic Year 2016

Second Year, Third Semester

Curriculum

Sl. No.		Code	Paper	Contact Periods/ week				Total Contact Hours	Credit
				L	T	P	S		
THEORY:									
1	BS	M 301	Mathematics III	3	1	-	-	4	4

2	PC	EC(EE)301	Digital Electronics	3	1	-	-	4	3
3	PC	EC(EE)302	Analog Electronic Circuits	3	0	-	-	3	3
4	PC	EE301	Circuits Theory And Networks	3	1	-	-	4	4
5	PC	EE 302	Field Theory	3	0	-	-	3	3
6	ES	ME(EE)301	Thermal Power Engineering	2	0	-	-	2	2
PRACTICAL									
1	PC	EC(EE)391	Analog & Digital Electronics lab	-	-	3	-	3	2
2	PC	EE391	Circuit Theory and Network Lab	-	-	3	-	3	2
3	ES	ME(EE)391	Thermal Power Engineering Lab	-	-	2	-	2	1
4	HU	HU381	Technical Report Writing & Language Practice	-	-	2	-	2	1
	Total Theory							20	19

	Total Practical	10	06
	GRAND TOTAL	30	25

Syllabus:

Theory

Paper Name: Mathematics –III

Paper Code: M301

Total Contact Hours: 40

Credit: 4

Pre requisites: 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 distinctive characteristics of mathematical approaches like Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equation, Partial Differential Equations.

M 301.2: Understand the theoretical workings of mathematical approaches like Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equations, and Partial Differential Equations to evaluate the various measures in related field.

M 301.3: Apply various principles of Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equations, Partial Differential Equations to solve various problems.

CO-PO Mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
M 301.1	H	M	-	-	-	-	-	-	-	-	-	L
M 301.2	H	M	-	-	-	-	-	-	-	-	-	L
M 301.3	H	M	M	-	-	-	-	-	-	-	-	L

Course contents:

MODULE I [10L]

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 [10L]

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. Examples.Fourier Transform of Derivatives.Examples.Convolution Theorem (statement only), Inverse of Fourier Transform, Examples.

Discussions on application of the topic related to EE

MODULE II[10L]

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 EE

MODULE III[12L]

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 EE

MODULE IV[12L]

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 EE

TOTAL LECTURES: 44

Text Books:

1

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

2

. Gupta S. C and Kapoor V K: Fundamentals of Mathematical

3

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

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

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

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

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

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

Reference Books:

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

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

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

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

5.Jana- Undergradute Mathematics

6..Lakshminarayan- Engineering Math 1.2.3

7.Gupta- Mathematical Physics (Vikas)

8.Singh- Modern Algebra

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

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

11.Delampady, M: Probability & Statistics, Universities Press

12.Prasad: Partial Differential Equations, New Age International

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

14.Bhat: Modern Probability Theory, New Age International

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

16.Sarveswarao: Engineering Mathematics, Universities Press

17.Dhami: Differential Calculus, New Age International

Paper Name: Digital Electronics

Paper Code: EC (EE) 301

Total Contact Hours: 40

Credit: 3

Pre requisites: Knowledge of Basic Electronics and mathematics.

Course Objective:

a. To perform decimal, octal, hexadecimal, and binary conversions.

b. To apply Boolean algebra to solve logic functions.

c. To analyze pulse and logic switching circuits.

d. To analyze digital decoding & multiplexing circuits.

e. To analyze logic family interfaces.

f. To analyze memory storage devices

g. To prepare Arithmetic Logic Unit

h. To apply logic design circuits with Programmable Logic Devices

Course Outcome:

The students will be able to:

CO1: Acquired knowledge about solving problems related to number systems conversions and Boolean algebra and design logic circuits using logic gates to their simplest forms using De Morgan’s Theorems; Karnaugh Maps.

CO2: Design of combinational circuits

CO3: Design of various synchronous and asynchronous sequential circuits using State Diagrams & Tables.

CO4: Understand DAC & ADC technique and corresponding circuits

CO5: Analyze logic family interfaces, switching circuits & memory storage devices to Plan and execute projects.

Mapping of CO with PO:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3	1	3	1	1	1	1	1	1	3
2	3	3	3	1	3	1	1	1	1	1	1	3
3	3	3	3	3	3	2	2	1	1	1	2	3
4	3	3	3	3	3	2	2	1	1	2	1	3
5	3	3	3	3	3	1	2	1	2	2	2	3

Course contents:

Module1 [12L]

Binary, Octal and Hexadecimal number system representation and their conversions; BCD, ASCII, EBDIC, Gray codes and their conversions; Hamming Code. Signed binary number representation with 1’s, 2’s, 9’s and 10’s complement methods, Binary arithmetic.

Boolean algebra; Various Logic gates- their truth tables and circuits; Representation in SOP and POS forms; Minimization of logic expressions by algebraic method, K-map

method, Quine-McCluskey minimization technique (Tabular Method).

Module-2[11L]

Combinational circuits- Half Adder, Full Adder, Serial & Parallel Adder, Carry Look Ahead Adder, BCD Adder, Half Subtractor, Full Subtractor circuits, Adder-Subtractor Circuit. Encoder, Decoder, Multiplexer, De Multiplexer, Adder & Subtractor Design

using decoder & multiplexer, Comparator and Parity Generator-Checker.

Module-3[11L]

Sequential Circuits- latch & Flip Flops-S-R, J-K, D and T, Conversion of Flip Flops, Various types of Shift Registers-SISO, SIPO, PISO,PIPO, Bidirectional & Universal Shift. Counters-Synchronous, Asynchronous, Irregular, Self Correcting Ring &

Johnson Counter. Application of Counter (Stepper motor control. [11]

Module-4[6L]

Parameters of D/A & A/D Converters. Different types of A/D -Flash Type, Successive Approximation and Dual Slope and D/A -R-2R Ladder.

Logic families- TTL, ECL, MOS and CMOS, their operation and specifications. TTL

Equivalent Circuit.

Paper Name: ANALOG ELECTRONIC CIRCUITS

Paper Code: EC (EE) 302

Total Contact Hours: 34

Credit: 3

Pre requisites:

. Basic knowledge about electronic components(R,L,C). Network Theorems (Kirchoffs law, Thevenin's theorem, Norton's theorem, Miller theorem etc.). Basic knowledge about the operation of semiconductor devices (Diode, Transistor, JFET, MOSFET, etc.),Basic idea of integrated circuit, Voltage current equations. Basic knowledge of Differentiation, Integration, Differential equation, matrix etc.

Course Objective:

Students will be able to design, test and examine simple circuits with diode, transistor, op-amp, etc. They will have clear knowledge of basic circuit analysis and its functions and their limitations. Most importantly they will be able to understand, modify and repair majority of circuits used in professional equipment design. They will also be able to take-up new design exercise.

Course Outcome:

CO1: Students will be able to design D.C power supplies.

CO2: Students will be able to analyze transistor amplifier circuit.

CO3: Students will be able to understand effects of different feedback mechanism in amplifier circuit.

CO4: Students will be able to analyze signal generator Circuit.

CO5: Student will be able to design power amplifier circuit.

CO6: Students will be able to understand linear and nonlinear applications of OPAMP (I.C-741).

CO- PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	2	-	3	-	-	3
CO2	3	3	3	3	2	-	2	-	3	-	-	3
CO3	3	3	3	3	2	-	2	-	3	-	-	3
CO4	3	3	3	3	2	-	2	-	3	-	-	3
CO5	3	3	3	3	2	-	2	-	3	-	-	3
CO6	3	3	3	3	2	-	2	-	3	-	-	3

Course contents:

Module1 [4L]

Filters & Regulators:

Capacitor filter, π-section filter, ripple factor, series and shunt voltage regulator, line and load regulation, 78xx and 79xx series, concept of SMPS.

Module-2[4L]

Transistor biasing & stability:

Biasing technique, Q-point & its Stability, Self Bias-CE configuration, Bias Compensation techniques, h-parameter model of transistors, Expression for voltage gain, current gain, input and output impedance, power gain, Trans-resistance & Trans-conductance Emitter follower Circuit.

Module-3[5L]

Transistor amplifier:

Different coupling techniques, RC coupled amplifier, functions of all components, derivation of voltage gain, current gain, input impedance and output impedance, High frequency model of transistors (hybrid-π model), frequency response characteristics, Expression for lower and upper half frequencies, bandwidth, and concept of wide band amplifier

Module-4[5L]

Feedback amplifier & Oscillators:

Concept of feedback, negative & positive feedback, Voltage/Current & Series/Shunt Feedback Berkhausen criterion, RC Oscillators-Phase shift and Wein bridge oscillators, LC Oscillator-Colpitts, Hartley's and crystal oscillators.

Module-5[5L]

Operational amplifier:

Ideal OPAMP, Differential amplifier, Constant current source (Current mirror etc), Level

Shifter, CMRR, Open & closed loop circuits, importance of feedback loop (positive & negative), inverting & non- inverting amplifiers, Voltage follower/Buffer circuits,

Module-6[5L]

Application of Operational amplifiers:

Adder & subtractor circuit, practical integrator & differentiator circuit, Instrumentation Amplifier, Log & Anti-log amplifiers, multipliers, Precision Rectifier, Comparator &Schmitt Trigger, Voltage to

Current & Current to voltage converter.

Module-7[3L]

Power amplifier:

Power amplifiers: Class A, B, AB, C, Conversion efficiency, Tuned amplifier.

Module-8[2L]

Multivibrator:

Multivibrators: Astable, Monostable, Bitable multivibrators; Astable and Monostable operation using 555 timers

Module-9[2L]

Special function circuits:

VCO, PLL

Paper Name: CIRCUIT THEORY & NETWORKS

Paper Code: EE301

Total Contact Hours:42

Credit: 4

Pre requisites:

Concepts of Basic Mathematics.

Concepts of Basic Electrical Engineering

Course Objective:

Finds utility in understanding the concepts in other electrical subjects such as Electrical Power System, Electrical Measurement and Instrumentation, & Electrical Machines, Control System etc.

Course Outcome:

COs	CO Statement
EE301.1	Know the basic concepts of electric & magnetic circuits and define associated terms
EE301.2	Know operation of different OP-amp based filters
EE301.3	Understand and analysis transient and steady-state response of any electrical circuit/network by applying different circuit analysis methods.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											
CO2	H											
CO3	M	H	M									

Course contents

MODULE I[3L]

Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks , Independent & Dependent sources, Step, Ramp, Impulse,

Sinusoidal, Square, Saw tooth signals, Source transformation, KVL & KCL.

MODULE II[5L]

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.

MODULE III[8L]

Definition Of Laplace Transform, Advantages, Initial Value theorem and final value theorem, Poles, zeros, transfer function, Laplace Transform of different types of signals, Step & Impulse response of RL, RC,RLC circuits(series & parallel),Transient Analysis Of different Electric Circuits with & without initial conditions, using Laplace Transform, Laplace Transform Of Periodic

Functions.

MODULE IV[9L]

Loop variable analysis, Node variable analysis,Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Millman's Theorem, Tellegen and

Reciprocity Theorems, Compensation theorem Solution of Problems with DC & AC sources.

MODULE V[5L]

Concept of Tree, Branch, Tree link, Incidence Matrix, Cut Set Matrix, Tie Set Matrix,

Formation of incidence, tie set, cut set matrices of electric circuits.

MODULE VI[8L]

Open circuit Impedance & Short circuit Admittance parameter, Transmission parameter, Hybrid Parameter, Conditions Of Reciprocity And Symmetry, Interrelation between different parameters, Driving point impedance & Admittance. Interconnection Of Two Port Networks.

Solution of problems. (8)

MODULE VII[4L]

Analysis and synthesis of Low pass, High pass, Band pass, Band reject, All pass

Filters (first and second order only) using operational amplifier. (4)

Text Books:

1. Networks and Systems, D. Roy Chowdhury, New Age International Publishers
2. Network Analysis and Synthesis, C.L. Wadhwa, New Age International Publishers
3. Circuit and Networks: Analysis and synthesis, A. Sudhakar & S.S. Palli

4th edition. Tata Mc Graw Hill Education Pvt. Ltd.

4. Circuit theory, Dr. Abhijit Chakrabarty, Dhanpat Rai & Co Pvt. Ltd.

Reference Books:

1. Network Analysis, M.E. Valkenburg, Pearson Education .
2. Fundamental of Electric circuit theory, D. Chattopadhay & P.C. Rakshit, S. Chand.
3. Engineering Circuit Analysis, W.H. Hyat, J.E. Kemmerly & S.M. Durbin, The Mc Graw Hill

Company.

Paper Name: FIELD THEORY

Paper Code: EE302

Total Contact Hours: 35

Credit: 3

Pre requisites:

Concept of mathematics, physics and basic electrical engineering

Course Objective:

Provide knowledge electrostatics and electromagnetism for the analysis of electrical machine performance.

Finds usefulness in understating the concepts in electrical machine and power system.

Course Outcome:

COs	CO Statement
EE302.1	Know the orthogonal co-ordinates & their transformation to solve & analyze problems on vector calculus
EE302.2	Know the basic laws of electrostatics and electromagnetism and define associated terms
EE302.3	Understand Maxwell’s equation in different forms
EE302.4	Understand the propagation of EM waves associated with power system transmission line

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											

CO2	H											
CO3	H											
CO4	H											

Course contents

Module1 [6L]

Co-ordinate systems, Cartesian coordinates, Circular cylindrical coordinates, Spherical coordinates & their transformation. Differential length, area and volume in different coordinate systems. Solution of problems.

Module-2[4L]

Introduction to Vector calculus:

DEL operator, Gradient of a scalar, Divergence of a vector & Divergence theorem, Curl of a Vector & Strokes theorem, Laplacian of a scalar, Solution of problems

Module-3[5L]

Electrostatic field:

Coulomb's law, field intensity, Gauss's law, Electric potential and potential gradient, Relation between E and V, an Electric dipole and flux lines. Energy density in electrostatic field. Boundary conditions: Dielectric-dielectric, Conductor –dielectric, Conductor-free space. Poisson's and Laplace's equation, General procedure for solving Poisson's and Laplace's equation. Solution of problems

Module-4[5L]

Magneto static fields:

Biot- savart law, Ampere's circuit law, Magnetic flux density, Magnetic static and Vector potential, Forces due to magnetic field, Magnetic torque and moments, Magnetization in material, Magnetic boundary condition, Inductor and Inductances, Magnetic energy, Force on magnetic material, Magnetic friction, Solution of problems

Module-5[6L]

Electromagnetic fields:

Faraday's law, Transformer and motional emf, Displacement current, Maxwell's equations, Solution of problems.

Module-6[6L]

Electromagnetic wave propagation:

Wave equation, Wave equation in conducting medium, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good and dielectric conductor, Skin effect, Skin depth, Power & Poynting vector, Reflection of a plane wave at normal incidence, Idea of diffraction, Polarisation, Solution of problems .

Module-7[3L]

Transmission line:

Concept of lump & distributed parameters, Line parameters, Transmission line equation & solutions, Physical significance of solutions.

Text Books:

1. Elements of Electromagnetic, Mathew N.O. Sadiku, 4h edition, Oxford University press.
2. Engineering Electromagnetic, W.H. Hyat & J.A. Buck, 7th Edition, TMH
3. Theory and problems of Electromagnetic, Edminister, 2ndEdition, TMH
4. Electromagnetic field theory fundamentals, Guru & Hizroglu, 2nd edition, Cambridge University Press.
5. Elements of Electromagnetic Fields, S.P. Seth, Dhanpat Rai & Sons.

Reference Books:

1. Electromagnetic with application, Krause, 5th Edition, TMH.
2. Elements of Engineering Electromagnetic, N.N. Rao, 6th Edition, Pearson Education

Theory

Paper Name: Thermal Power Engineering

Paper Code: ME (EE) 301

Credits: 2, Contact Periods/Week: 2, Total contact hour: 30

Pre requisites: Engineering Thermodynamics & Fluid Mechanics (ME201).

Course Objective:

To learn minute details of thermal power generation systems based Vapor Power and Gas power and their components, working principle for solving industrial problems.

Course Outcome:

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

1. Get detailed knowledge on the working principle of mountings and accessories of fire tube and water tube boilers.

2. Understand draught systems and carry out heat balance of a power plant to evaluate efficiency.

3. Analyze the working of steam nozzles and variety of turbines to carry out design based project works and solution of industrial problems

4. Evaluate the performance of I.C Engines and Gas turbines.

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME(EE)301.1	2	-	2		-	-	-	-	-	-	1	1
ME(EE)301.2	2	3	2	2	-	1	2	-	-	-	-	1
ME(EE)301.3	2	2	3	2	-	-	-	-	-	-	1	1
ME(EE)301.4	3	2	1	2	-	1	2	-	-	-	-	1

1-L,2-M,&3-H

COURSE CONTENTS:

MODULE I [9L]

Boilers – Its function, classification – Water tube and Fire tube boilers. Circulating principles – Natural and Forced circulation, Super critical boiler. Boiler accessories: Super heaters, Reheaters, Economiser, Air preheater. Boiler Performances analysis and heat balance, Draught Systems, Calculation of Chimney height.

MODULE II [5L]

Basics of steam nozzle, Isentropic flow through nozzle, Mass of Steam discharged, choked flow and critical pressure ratio, Use of Mollier Diagram

MODULE III [6L]

Steam turbines – Principle of operation, Classification, Optimum velocity ratio, Calculation of work and efficiency for Simple impulse turbine, Pressure & Velocity compounded impulse turbine, and Reaction Turbine, Turbine losses and Governing

MODULE IV [6L]

IC Engines – classifications, working principle, valve timings, and Engine performance: engine power, efficiency, mean effective pressure, Testing of IC engine, heat balance, engine exhaust emission and control

MODULE V [4L]

Gas Turbine–Closed and open cycle, efficiencies, Optimum pressure ratio, Use of regenerator, intercooling and reheating.

Text:

1. P.K.Nag- Engineering Thermodynamics – TMH ,2/e

2. P K Nag- Power Plant Engg. - TMH Pub

3. P.S. Ballaney- Thermal Engineering – Khanna Pub

4. Domkundwar & Arora- Power Plant Engineering –.Dhanpat Rai & Co.

5. A Text Book of Power Plant Engineering – R. K. Rajput – Laxmi Publications (P) Ltd

Reference:

1. Cengel --- Thermodynamics, 3/e, TMH

2. Et-Wakil—Power Plant Engineering, MH

3. M W Zemansky & R.H.Dittman -Heat and Thermodynamics – McGraw Hill ,7/e

Paper Name: ANALOG & DIGITAL ELECTRONIC CIRCUIT

Paper Code: EC (EE) 391

Total Contact Hours:

Credit: 2

Pre requisites:

Knowledge in electrical circuits and electronic devices

Course Objective:

To provide the basic skills required to understand, develop, and design of various engineering applications involving Digital Electronic & Circuits.

To provide basic laboratory exposures for Analog Circuits and applications.

Course Outcome:

CO1: Able to understand the fundamental concepts and techniques used in digital electronics.

CO2: Able to understand and examine the structure of various number systems, De-Morgan's law, Boolean algebra and its application in digital design.

CO3: Able to understand, analyse the analog circuits pertaining to applications like amplifier, oscillators and timer.

CO4: Able to know how to interface digital circuits with ADC & DAC.

CO-PO MAPPING:

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

Course contents

Study of Ripple and Regulation characteristics of full wave rectifier with and without capacitor filter.

Study of Zener diode as voltage regulator.

Construction of two stages R-C coupled amplifier & study of its gain and Bandwith.

Study of class A, C & Push pull amplifier.

5. Realizations V-I & I-V converter using Operational Amplifier.

6.Study of timer circuit using NE 555 and configuration of Monostable and Astable Multivibrator.

7. Study of DAC & ADC

8. Realisation of basic gates using Universal logic gates.

9. Realisation of RS-JK & D filpflop using logic gates.

10. Design of Combinational circuit for BCD to decimal conversion to drive 7-segment display using Multiplexer.

11. Realisation of Synchronous Up/Down counter.

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

13. Construction of adder circuit using Shift register & Full adder.

Paper Name: CIRCUIT THEORY AND NETWORK LAB

Paper Code: EE391

Total Contact Hours:

Credit: 2

Pre requisites:

Concepts of Electrical Parameters Measurement.

Course Objective:

Provide knowledge for the analysis of basic electrical circuit.

Use the modern tools in analysis of electrical circuit.

Course Outcome:

COs	CO Statement

EE391.1	Demonstrate transient analysis of electric circuits frequency response characteristics of Filter circuits
EE391.2	Simulate electric circuits, signals, algorithms using software simulator

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H		L	H				L	L		
CO2	M		M	L	H				L	L		

Course contents

LIST OF EXPERIMENTS

Transient response of R-L and R-C network: simulation with PSPICE/MATLAB /Hardware

Transient response of R-L-C series and parallel circuit: Simulation with PSPICE/MATLAB / Hardware

Study the effect of inductance on step response of series RL circuit in

MATLAB/HARDWARE.

Determination of Impedance (Z) and Admittance (Y) parameter of two port network: Simulation / Hardware.

Frequency response of LP and HP filters: Simulation / Hardware.

Frequency response of BP and BR filters: Simulation /Hardware.

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

Determination of Laplace transform and Inverse Laplace transform using MATLAB.

Amplitude and Phase spectrum analysis of different signals using MATLAB.

Verification of Network theorem using SPICE/MATLAB

Paper Name: THERMAL POWER ENGINEERING LABORATORY

Paper Code: ME(EE)391

Credits: 2, Contact Periods/Week: 3, Total contact hour: 40

Pre requisites: Engineering Thermodynamics & Fluid Mechanics (ME201).

Course Objective:

The main objective of this lab is to develop an idea of Boiler & IC Engine function with the cut model and fuel properties.

Course Outcome:

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

1. Understand operations of different type of Boilers, their mountings and accessories.

2. Evaluate the performance of a four stroke engine with varying load and speed.

3. Carry out the heat balance of an I C Engine for design and development of solution.

4. Determine calorific value of a fuel useful for future project works.

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME(EE)391.1	2	-	2	-	-	-	-	-	1	-	1	2
ME(EE)391.2	1	2	3	1	-	1	1	-	3	2	2	1
ME(EE)391.3	1	2	2	1	-	2	2	-	3	2	1	1
ME(EE)391.4	-	-	2	-	-	3	2	-	2	1	1	1

COURSE CONTENTS:

1. Study of Cut Models – Boilers

Lancashire Boiler

Babcock & Willcox Boiler

Cochran Boiler

Vertical Tubular Boiler

Locomotive Boiler

2. Study of Cut Models –IC Engines

4S Diesel Engine

4S Petrol Engine

2S Petrol Engine

3. Load Test on 4 Stroke Petrol Engine & Diesel Engine by Electrical Load Box.

4. Load Test on 4 Stroke Diesel Engines by Rope Brake Dynamometer.

5. Heat Balance on 4 Stroke Diesel Engine by Rope Brake Dynamometer

6. Valve Timing Diagram on 4S Diesel Engine Model & 4S Petrol Engine Model.

7. To find the Calorific Value of Diesel Fuel & Coal by Bomb Calorimeter.

8. To find the Flash Point & Fire Point of Petrol & Diesel Fuel

1-L,2-M.&3-H

Paper Name: Technical Report Writing & Language Practice

Paper Code: HU 381

Total Contact Hours:

Credit: 1

Pre-requisites:

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

Course Objectives: By the end of the course the student should be able to

1.1:Understand and make use of a wide taxonomy of listening skills & sub-skills for comprehending & interpreting data in English

1.2:Speak in English, using appropriate vocabulary and pronunciation in contextualized situations

1.3:Understand and put into effective practice the pragmatics of Group Discussion

1.4:Understand and write a detailed technical report as per organizational needs

1.5: Understand and interact in professional presentations and interviews

Course outcome: To maximize exposure and train students in the professional use of English in the globalized workplace.

Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO.1	3	-	-	3	-	3	-	-	3	3	-	-
CO.2	2	3	2	3	-	3	-	-	2	3	-	1
CO.3	1	3	-	3	-	2	-	-	2	3	-	1
CO.4	1	2	3	3	-	2	-	-	2	3	-	-
CO.5	3	3	2	3	-	2	-	-	2	3	-	1

Course content:

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

(c) 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

Second Year, Fourth Semester

Sl. No.		Code	Paper	Contact Periods/ week	Total Contact Hours	Credit

				L	T	P	S		
THEORY:									
1	BS	PH 401	Physics II	3	0	-	-	3	3
2	PC	EE 401	Electrical Machines I	3	1	-	-	4	4
3	PC	EE 402	Electrical and Electronics Measurement	3	0	-	-	3	3
4	BS	M(CS) 401	Numerical Methods	3	0	-	-	3	2
5	ES	CS(EE) 402	Data Structure	3	0	-	-	3	2
PRACTICAL:									
1	BS	PH(EE) 491	Physics II Lab	-	-	3	-	3	2
2	PC	EE491	Electrical Machines-I lab	-	-	3	-	3	2
3	PC	EE 492	Electrical and Electronics Measurement	-	-	3	-	3	2

			Lab.						
4	BS	M(CS)491	Numerical Methods Lab	-	-	2	-	2	1
5	ES	CS(EE) 492	Data Structure Lab	-	-	2	-	2	1
SESSIONAL									
6	MC	MC481	Technical Skill Development	-	-	2	-	2	0 (2 Units)
	Total Theory							16	14
	Total Practical							15	08
	TOTAL							31	22

Syllabus:

Theory

Paper Name: Physics-II (Gr-B/Gr-A)

Paper Code: PH 401 (for EE and AEIE)

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

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:

PH401.1: state

Basic postulates of Quantum Mechanics

Macro state and micro state for thermodynamic system.

Thermodynamic probability and phase space

Properties of Nano material.

Polarization

Bloch Theorem

Assumptions of Kronig-Penny Model

PH401.2: explain

Energy levels and energy states.

Distribution functions of Classical and quantum statistics.

Concept of quantum well, quantum wire and quantum dots.

Quantum confinement.

Different types of polarizability.

Dielectric loss.

Ferroelectric and Piezoelectric materials.

Ferromagnetic Hysteresis Loop

E-k diagram and Brillouin zone and crystal momentum

Nuclear Binding Energy

PH401.3: apply the knowledge of

Schrödinger equation in problems of junction diode, tunnel diode, 1-D potential box, 3-D potential box.

Nano-range and various types of nano materials.

Fermi Dirac statistics to metals and semiconductors.

Local electric field and Lorentz field in Clausius-Mossotti equation.

M, B , H and χ in realizing Curie law for different magnetic materials

Weiss molecular field theory in realizing Curie- Weiss law for Ferromagnetic materials

Soft and hard ferromagnets in different storage devices and other applications.

Free electron theory in deriving Weidemann and Franz law,

Kronig-Penny Model to classify different solid materials (metal, semiconductor, and insulator) based on characteristics of allowed and forbidden energy band.

Hall Effect to interpret its application in various real life situations.

Liquid drop model in Nuclear Fission and Fusion

PH401.4: Analyze

Behavior of dielectric under alternating field.

Hysteresis curve to describe properties of hard and soft ferromagnets.

Outcome of negative effective mass value to realize existence of both electron and holes in certain solids.

PH401.5: to evaluate

Under certain conditions quantum statistics collapses to classical statistics

Diamagnetic, Paramagnetic and Ferromagnetic materials.

Sommerfeld's energy quantization theorem to overcome the limitations of classical free electron theory (Drude's Theory)

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH 401.1	3	1	-	-	-	-	-	-	-	-	-	1
PH 401.2	3	1	-	-	-	-	-	-	-	-	-	1
PH 401.3	3	2	-	-	-	-	-	-	-	-	-	1
PH 401.4	2	3										-
PH 401.5	2	3										1

PH 401	2.6	2	-	-	-	-	-	-	-	-	-	1

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 θ_p , 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

Paper Name: ELECTRICAL MACHINES – I

Paper Code: EE401

Total Contact Hours:

Credit: 4

Pre requisites:

Concept of basic electrical engineering and field theory

Course Objective:

Provide knowledge to select the electrical machine for particular machine.

Study the performance and operation of d.c. machine, induction motor and transformer.

Course Outcome:

COs	CO Statement
EE401.1	Know the Electromechanical Energy Conversion principle and concept of magnetic to understand the basic principles of electrical machine and define terms associated with rotating electrical machine.
EE401.2	Based on different type of requirement know the applications of d.c. machine, induction motor and transformer for a given application
EE401.3	Understand the principle of operation and know performance of d.c. machine, induction motor and transformer.
EE401.4	Know different tests on electrical machine and determine the performance of d.c. machine, induction motor and transformer.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											
CO2	M											
CO3	H											L
CO4	H											

Course contents:

MODULE – I:

General introduction to Electrical Machines: 6L

Faraday's laws of electromagnetic induction, Fleming's rule and Lenz's Law. 1L

Electromagnetic energy conversion principle, singly and doubly excited magnetic system. Physical concept of torque production, electromagnetic and reluctance

torque. 1L

Concept of General terms pertaining to Rotating Machines: Electrical & Mechanical degree, Pole pitch, Coil, Generated EMF in full pitched coil,

Generated EMF in a short pitched coil, EMF polygon 2L

Distribution factor, Pitch factor. MMF produced by Distributed Windings, MMF of a coil, MMF of single phase distributed Winding, MMF waveform of

Commutator machines. 2L

MODULE – II:

Single-Phase Transformers: 6L

Core construction and different parts of transformer and their function, Materials used for core, winding and insulation, Transformer oil, Different types

of cooling methods (in brief), Name plate rating. 1L

Equivalent circuit and per unit representation and its importance, Regulation, Efficiency and All day efficiency, Numerical. 3L

Single-phase Auto transformer – Comparison of weight, copper loss with 2-
Winding transformer. 1L

Sumpner Test, Applications of 2-winding transformer & Auto transformer. 1L

MODULE – III:

Three-Phase Transformers: 11L

Types of three-phase transformer. Construction – Core type 3-limb, 5-limb and
Shell type, Flux distribution, Different types of windings. 1L

Polarity of transformer, Vector groups for various connections. 2L

Parallel operation and load sharing, Numerical. 2L

Effect of unbalanced loading and neutral shifting, Harmonics production and its
Suppression, Tertiary windings. 2L

Scott-connected transformer and open-delta connection – working principle,

Connection diagram, practical application. 2L

Tap-changing methods, Tap changers – Off load and On-load type. 1L

Special Transformer: Pulse transformer, Grounding transformer. 1L

MODULE – IV:

Three Phase Induction Motor: 10L

Induction motor as a transformer, Power stages in 3-phase induction motor and their relation, power-slip characteristics, Losses, Efficiency, Numerical. 3L

Determination of equivalent circuit parameters, Separation of losses, Numerical. 2L

Effect of change in rotor resistance in slip-ring machine and slip power recovery. 1L

Concept of Deep bar and Double cage rotor. 1L

Starting and speed control of three phase induction motor. 1L

Space harmonics: Crawling and Cogging, Brief idea of braking of induction Motor. 1L

Industrial applications of 3-phase induction motor. 1L

MODULE – V:

D.C. Machine: 7L

EMF generation in armature, Methods of building up of e.m.f, Significance of Critical resistance and Critical speed. 1L

Armature reaction and its effect, Function of Interpole and Compensating Winding. 1L

Commutation method, Concept of reactance voltage. 1L

Power flow diagram, Losses and efficiency, Numerical. 2L

Testing of dc machines – Hopkinson's, Swinburne's test, Brake test (Tests

Specified as per standards). 1L

Amplidyne, Industrial applications of dc machine. 1L

Text Books:

1 Electrical Machinery, P.S. Bhimra, 6th Edition, Khanna Publishers.

2 Electric machines, D.P. Kothari & I.J Nagrath, 3rd Edition, Tata Mc Graw-Hill Publishing Company Limited.

3 Electrical Machines, P.K. Mukherjee & S. Chakrabarty, Dhanpat Rai Publication.

Reference Books:

1. Electric Machinery & Transformers, Bhag S. Guru and H.R. Hiziroglu, 3rd Edition, Oxford University press.

2. Electrical Machines, R.K. Srivastava, Cengage Learning

3. Theory of Alternating Current Machinery, Alexander S Langsdorf, Tata Mc Graw Hill Edition.

4. The performance and Design of Alternating Current Machines, M.G.Say, CBS Publishers & Distributors.

5. Electric Machinery & transformer, Irving L Koskow, 2nd Edition, Prentice Hall India

Paper Name: Electrical & Electronics Measurement

Paper Code: EE402

Total Contact Hours:

Credit: 3

Pre requisites:

Concepts of basic Electrical Engineering.

Course Objective:

To provide the knowledge of different electrical parameters.

To become acquainted with different measuring instruments.

Course Outcome:

COs	CO Statement
EE402.1	Understand the basics of Electrical measuring system.
EE402.2	Study the measurement of Resistance, Inductance, Capactance, Power, Energy, PF and Insulation resistance.
EE402.3	Study different measuring instruments.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	H											
CO3	M											

Course contents:

Module-I

Measurements: (3)

Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision,

Resolution, Speed of response, Errors in measurement.

Analog meters: (3)

General features, Construction, Principle of operation and torque equation of Moving coil and Moving iron, Electrodynamometer, Induction instruments,Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers.

Galvanometer : (1)

Classification, Principle of operation, Advantage, Disadvantage, Error and Application.

Module-II

Instrument transformer: (3)

Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current &

Potential transformer, errors.

Measurement of Power: (3)

• Principle of operation of Electrodynamic & Induction type wattmeter. Wattmeter errors.

Measurement of resistance: (3)

• Measurement of medium, low and high resistances, Megger.

Module-III

Measurement of Energy: (2)

• Construction, theory and application of AC energy meter. Testing of energy meters.

Potentiometer: (3)

Principle of operation and application of Crompton’s DC potentiometer, Polar and Co-ordinate type AC potentiometer. Application.

AC Bridges: (4)

• Measurement of Inductance, Capacitance frequency

Power Factor Meter (1)

Measurement of power factor

1-Ø & 3-Ø dynamometer type power factor meter, 1-Ø moving iron power factor meter

Module-IV

Cathode ray oscilloscope (CRO): (2)

Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO.

Electronic Instruments: (3)

Digital voltmeter(Electronic), Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Sensors & Transducers: (4)

Introduction to sensors & Transducers, Strain gauge, LVDT, Temperature transducers, Flow measurement using magnetic flow measurement.

Text Books:

A course in Electrical & Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai & sons.

Electrical Measurement & Measuring Instruments, E.W. Golding & F.C. Wides, Wheeler Publishing.

Electronic Instruments, H.S. Kalsi, Tata Mc-Graw hill, 2nd Edition.

Reference Books:

Sensors & Transducers, D. Patranabis, PHI, 2nd edition.

Digital Instrumentation, A.J. Bouwens, Tata Mc-Graw hill.

Modern Electronic instrumentation & Measuring instruments, A.D. Heltric & W.C. Copper, Wheeler Publication.

Instrument transducers, H.K.P. Neubert, Oxford University press.

Paper Name: NUMERICAL METHODS

Paper Code: M(CS) 401

Total Contact Hours: 33

Credit: 3

Pre requisites: 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) 401.1: Recall the distinctive characteristics of various numerical techniques and the associated error measures.

M(CS) 401.2: Understand the theoretical workings of various numerical techniques and to solve the engineering problems.

M(CS) 401.3: Apply the principles of various numerical techniques to solve various problems.

CO-PO Mapping:

PO	PO	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12

CO	1											
M(CS) 401.1	3	2	-	-	-	-	-	-	-	-	-	1
M(CS) 401.2	3	2	-	-	-	-	-	-	-	-	-	1
M(CS) 401.3	3	2	2	-	-	-	-	-	-	-	-	1

1-L, 2-M, &3-H

Course contents:

MODULE I: NUMERICAL METHOD I

Approximation in numerical computation: Truncation and rounding errors, Propagation of 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 modified 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:

Shishir Gupta &S.Dey, Numerical Methods, Mc. Graw hill Education Pvt. Ltd.

C.Xavier: C Language and Numerical Methods, New age International Publisher.

Dutta& Jana: Introductory Numerical Analysis. PHI Learning

J.B.Scarborough: Numerical Mathematical Analysis.Oxford and IBH Publishing

Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).New age International Publisher.

Prasun Nayek: Numerical Analysis, Asian Books.

References:

Balagurusamy: Numerical Methods, Scitech. TMH

Baburam: Numerical Methods, Pearson Education.

N. Dutta: Computer Programming & Numerical Analysis, Universities Press.

SoumenGuha& Rajesh Srivastava: Numerical Methods, Oxford Universities Press.

Srimanta Pal: Numerical Methods, Oxford Universities Press.

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

Paper Name: Data Structures

Paper Code: CS(EE)402

Total Contact Hours: 36

Credit: 3

Pre requisites:

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 sorting and searching.

Course Outcome:

On completion of the course students will be able to

CS301.1: Differentiate how the choices of data structure & algorithm methods impact the performance of program.

CS301.2: Solve problems based upon different data structure & also write programs.

CS301.3: Identify appropriate data structure & algorithmic methods in solving problem.

CS301.4: Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

CS301.5: Compare and contrast the benefits of dynamic and static data structures implementations.

CO-PO Mapping

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS(EE)402.1	3	3	2	2	3	2	2	3	3	3	2	3
CS(EE)402.2	3	2	2	2	2	2	3	2	2	3	3	2
CS(EE)402.3	3	3	3	2	3	3	3	2	2	3	3	2
CS(EE)402.4	3	3	3	3	3	3	3	3	3	3	3	3
CS(EE)402.5	3	3	3	3	3	3	3	3	3	3	3	3
CS(EE)402	3	3	3	2	3	3	3	3	3	3	3	3

Course contents:

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:

"Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung

"Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed

"Data Structures in C" by Aaron M. Tenenbaum

"Data Structures" by S. Lipschutz

"Data Structures Using C" by Reema Thareja

"Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev

Paper Name: PHYSICS-II Lab

Paper Code: PH 491

Total Contact Hours: 36

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:

PH 491.1: demonstrate

Dipolar magnetic behavior

Action of capacitors

Fermi levels and band gap in a semiconductor

Function of Light emitting diode

Magnetic and semiconductor storage devices

Motion of electron under cross fields

PH 491.2: conduct experiments using

Insulators, Semiconductors (extrinsic and intrinsic), Light emitting diodes

Cathode ray oscilloscope

Various types of magnetic materials

PH 491.3: Function effectively as an individual, and as a member or leader in laboratory sessions

PH 491.4: communicate effectively, write reports and make effective presentation using available technology

on presentation of laboratory experiment reports

On presentation of innovative experiments

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH 491.1	3	2	-	-	-	-	-	-	-	-	-	1
PH 491.2	1	2	-	3	-	-	-	-	-	-	-	1
PH 491.3	1	2	-	-	-	-	-	-	3	-	-	1
PH (491.4	1	2	-	-	-	-	-	-	-	3	-	1
PH 491	1.5	2	-	3	-	-	-	-	3	3	-	1

Course contents:

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

Study of dipolar magnetic field behavior.

Study of hysteresis curve of a ferromagnetic material using CRO.

Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.

Measurement of Curie temperature of the given sample.

Determination of dielectric constant of given sample (frequency dependent)/Measurement of losses in a dielectric using LCR circuits.

Module 2: Quantum Mechanics-II (6L)

Determination of Stefan's radiation constant.

To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells & measurement of maximum workable power.

Measurement of specific charge of electron using CRT.

Module 4: Solid state physics (9L)

Determination of band gap of a semiconductor.

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:

Determination of thermal conductivity of a bad conductor by Lees and Chorlton’s method.

Determination of thermal conductivity of a good conductor by Searle’s mothod.

Study of I-V characteristics of a LED.

Study of I-V characteristics of a LDR

Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.

Paper Name: ELECTRICAL MACHINES – I

Paper Code: EE 491

Total Contact Hours:

Credit: 2

Pre requisites:

Concepts of Electrical Machine.

Course Objective:

Provide the knowledge of d.c. machine, induction motor and transformer performance.

Course Outcome:

COs	CO Statement
EE491.1	Perform different tests on d.c. machine, induction motor and transformer
EE491.2	Interpret the observed result using theoretical knowledge and hence calculate unknown parameters

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			H					H	M		L
CO2	M			H					H	M		L

Course contents:

List of Experiments:

At least ten experiments to be performed

Heat-run test of a single-phase transformer.

Regulation and Efficiency of single-phase transformer by direct loading method.

Parallel operation of two single-phase transformer and find out the load sharing between them.

Efficiency of a single-phase transformer by Back-to-Back test.

Polarity test and vector grouping of a three-phase transformer.

Swinburne test of a D.C. shunt motor.

Brake test of D.C. series motor

Voltage build-up of a D.C. shunt generator and find out critical resistance and critical speed.

Circle diagram of a three-phase Induction Motor.

Speed control of three-phase Induction Motor by V/f constant.

Separation of losses in three-phase Induction Motor.

Load test of a three-phase wound rotor Induction Motor.

Paper Name: Electrical & Electronics Measurement Lab

Paper Code: EE 492

Total Contact Hours:

Credit: 2

Pre requisites:

Concepts of different measuring system.

Course Objective:

Familiarization with different electrical measuring system

Course Outcome:

COs	CO Statement
EE492.1	Conduct experiment to measure of Resistance, Inductance, Capacitance, Power, and Energy.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			H					H	M		L

Course contents:

1. Instrument workshop- Observe the construction of PMMC, Dynamometer, Electro-thermal and Rectifier type of instruments, Oscilloscope and Digital multimeter.

Calibrate moving iron and electrodynamometer type ammeter/voltmeter by potentiometer.

Calibrate dynamometer type wattmeter by potentiometer.

Calibrate AC energy meter.

Application of Kelvin double bridge by using D’ Arsonval Galvanometer.

Measurement of power using Instrument transformer.

Measurement of power in Polyphase circuits.

Measurement of frequency by Wien Bridge.

Measurement of Inductance by Anderson bridge

Measurement of capacitance by De Sauty Bridge.

Measurement of capacitance by Schering Bridge.

Testing of Energy Meter

Calibration of Electronic Volt meter

F/V and V/F converter application

Paper Name: NUMERICAL METHODS

Paper Code: M(CS) 491

Total Contact Hours:

Credit: 2

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) 491.1: Apply the programming skills to solve the problems using multiple numerical approaches.

M(CS) 491.2: Analyze if the results are reasonable, and then interpret and clearly communicate the results.

CO-PO Mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
M(CS) 491.1	2	1	-	-	3	-	-	-	-	-	-	1
M(CS) 491.2	2	1	-	-	3	-	-	-	-	-	-	1

Course contents:

Assignments on Newton forward /backward, Lagrange's interpolation, Sterling & Bessel's Interpolation formula, Newton's divided difference Interpolation.

Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule and Romberg Integration.

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.

Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Secant Method, Newton-Raphson method

Assignments on ordinary differential equation: Euler's method, Euler's modified method, Runge-Kutta methods, Taylor series method and Predictor-Corrector method.

Assignments on numerical solution of partial differential equation: Finite Difference method, Crank–Nicolson method.

Implementation of numerical methods on computer through C/C++ and commercial Software Packages: Matlab / Scilab / Labview / Mathematica/NAG (Numerical Algorithms Group/Python.

Paper Name: Data Structures Lab

Paper Code: CS(EE)492

Total Contact Hours:

Credit: 2

Pre requisites:

Familiarity with the fundamentals of C or other programming language.

A solid background in mathematics, including probability, set theory.

Course Objective:

To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.

To write and execute write programs in C to implement various sorting and searching methods.

Course Outcome:

On completion of the course students will be able to

CS(EE)492.1 Choose appropriate data structure as applied to specified problem definition.

CS(EE)492.2 Handle operations like searching, insertion, deletion, traversing mechanism on various data structures.

CS(EE)492.3 Have practical knowledge on the applications of data structures.

CS(EE)492.4 Able to store, manipulate and arrange data in an efficient manner.

CS(EE)492.5 Able to implement queue and stack using arrays and linked list. Implementation of queue, binary tree and binary search tree.

CO-PO Mapping

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS(EE)492.1	3	3	2	2	2	2	1	1		1		
CS(EE)492.2	3	2	2		2	2	1			1		2
CS(EE)492.3	2	1	1					1				
CS(EE)492.4	3	2		2		1	1		1		1	
CS(EE)492.5	1		2	1	2			1	1		1	2
CS(EE)492	3	2	2	2	2	2	1	1	1	1	1	2

Course contents:

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

TEXT BOOKS:

C and Data Structures, Third Edition, P.Padmanabham, BS Publications.

C and Data Structures, Prof. P.S.Deshpande and Prof. O.G. Kakde, Dreamtech Press.

Data structures using C, A.K.Sharma, 2nd edition, Pearson.

Data Structures using C, R.Thareja, Oxford University Press.

C and Data Structures, N.B.Venkateswarlu and E.V.Prasad,S.Chand.

C Programming and Data Structures, P.Radha Krishna, Hi-Tech Publishers.

Paper Name: Technical skill Development

Paper Code: MC 481

Total Contact Hours: 2(SESSIONAL)

Credit: 2 UNITS

Pre requisites: Knowledge of electrical circuit and component.

Course Objective:

To develop confidence among the young learners to approach and complete a mini project.

Course Outcome:

On completion of the course students will be able to

MC 481.1 Prepare lists of material for a mini project.

MC 481.2 Design an electric circuit as per the requirement of application.

CO-PO Mapping

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MC481.1	3	3	2	2	2	2	1	1		1		
MC481.2	3	2	2		2	2	1			1		2

Course contents:

Voltage regulator for household appliances.

Solar Mobile Charger.

Electric field Detector

Power Bank

Level control mechanism.

Op-amp trainer kit

Modern of dielectric power plant

Power Generation by wind mill

Smoke detector/Clap switch.

Third Year Fifth Semester

Sl. No.		Code	Paper	Contact Periods Per Week				Total Contact Hours	Credit
				L	T	P	S		
THEORY:									
1	HS	HU501	Environmental Science	2	0	0	0	2	2
2	PC	EE501	Electrical Machines-II	3	1	-	-	4	4
3	PC	EE502	Power Systems-I	3	1	-	-	4	4
4	PC	EE503	Control Systems-I	3	1	-	-	4	4

5	PC	EE504	Microprocessor and Microcontroller	2	0	-	-	2	2
PRACTICAL:									
1	PC	EE591	Electrical Machines-II Lab	0	0	3	0	3	2
2	PC	EE592	Power Systems-I Lab	0	0	3	0	3	2
3	PC	EE593	Control System-I Lab	0	0	3	0	3	2
4	PC	EE594	Microprocessor and Microcontroller lab	0	0	2	0	2	1
5	PW	EE581	Electrical System Design-I	0	1	3	0	4	2
Sessional									
6	MC	MC 581	Group Discussion & Seminar	0	0	2	0	2	0 (2 Units)
	Total theory							16	16

	Total Practical & Sessional	17	09
	TOTAL	33	25

Paper Name: ENVIRONMENTAL SCIENCE

Paper Code: HU 501

Contact : 24 hours

Credit: 2

Pre requisites: Qualified B.Tech 1st year

Course Objective(s)

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(s)

To understand the natural environment and its relationships with human activities.

To apply the fundamental knowledge of science and engineering to assess environmental and health risk.

To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.

Acquire skills for scientific problem-solving related to air, water, noise & land pollution.

SYLLABUS

1.General

6L

1.1 Natural Resources: Forest Resource, water resource, mineral resource, energy resources: alternative source of energy

1.2 Population Growth: Exponential Growth, logistic growth, Maximum sustainable yield, demography

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(The Environment protection Act, Air pollution Act, Water Act, Wildlife Protection Act) , Hazardous waste(management and Handling) Rules.

2. Air pollution and control 7L

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 7L

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)

3.5 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).

4.3 Waste management: waste classification, waste segregation, treatment & disposal

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, L10 (18 hr Index) .

5.4 Noise pollution control.

Text Books

A Textbook of Environmental Studies, Shashi Chawla. Tata McGraw Hill Education Private Limited

References/Books

1. Environmental Studies, Dr. J P Sharma, University Science Press

Environmental Engineering, J K Das Mohapatra, Vikas Publication

CO- PO Mapping

Mapping of CO with PO

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2	2	3	-	-	2	3	3	-	-	1	2

Paper Name: ELECTRICAL MACHINES – II

Paper Code: EE501

Total Contact Hours: 33

Credit: 4

Pre requisites:

Concept of basic electrical engineering and field theory.

Course Objective:

Provide knowledge to select the electrical machine for particular machine.

Study the performance and troubleshoot the operation of synchronous machine and fractional kW motors.

Course Outcome:

COs	CO Statement
EE501.1	Based on different type of requirement know the applications of synchronous machine and fractional kW motors for a given application
EE501.2	Understand the principle of operation and know performance of synchronous machine and fractional kW motors.
EE501.3	Know different tests on electrical machine and determine the performance of synchronous machine.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L											
CO2	H	M										L
CO3	H			M								

Course contents:

MODULE – I:

Synchronous Machines: 23L

Construction of 3-phase Synchronous Machines, Description of salient & non-salient rotor, Advantages of Stationary armature and Rotating field system, Name plate rating. 2L

Methods of excitation systems: Static excitation, Brushless excitation, DC generator. 1L

Armature reaction at various p.f, concept of Synchronous reactance. 2L

Phasor diagrams of alternator at lagging, leading and unity p.f. loads. 1L

Voltage regulation of alternator by synchronous impedance method, Numericals. 2L

Open circuit characteristics, Short circuit characteristics of alternator and determination of synchronous reactance. 1L

Theory for salient pole machine, Two reaction theory, phasor diagram at different loads. 2L

Power angle characteristics of Synchronous machines, Numericals. 2L

Short circuit ratio (SCR) – concept and significance. 1L

Method of control of Active & Reactive Power of an alternator. 1L

Reasons and advantages of Parallel operation. 1L

Synchronization of two or more alternators: Three lamps method, Synchroscope. 1L

Parallel operation of (i) an alternator and infinite bus and (ii) Between two alternators and Load sharing between them. Numericals. 2L

Methods of starting of Three-Phase Synchronous Motor: by auxiliary motor and Damper winding. 1L

Effect of variation of excitation at infinite bus (over and under excitation) – V curves and inverted V-curves. 1L

Hunting and its prevention. 1L

Applications of synchronous motor, Synchronous condenser. 1L

MODULE – II:

Single-Phase Induction Motor: 12L

Construction, Concept of Pulsating Torque. 1L

Double-revolving field theory and Cross-Field Theory. 2L

Development of equivalent circuit, Determination of equivalent circuit parameters, Numericals. 2L

Methods of starting using auxiliary winding, Selection of capacitor value during starting and running, Numericals. 2L

Speed-Torque characteristics, Phasor diagram, Condition of Maximum torque.

2L

Constructional features and performance characteristics of Universal Series Motors, Compensated and uncompensated motors. 2L

Testing of Single phase motors and Applications. 1L

MODULE – III:

Special Machines: 5L

Principle and construction of switched Reluctance motor, Permanent magnet machines, Brushless DC machines, Hysteresis motor, Stepper Motor. 3L

Construction and Operational characteristics of Induction generator and Linear Induction motor. 2L

Text Books:

1. Electrical Machinery, P.S. Bhimra, Khanna Publishers.
2. Electrical Machines, Ashfaq Husain, Dhanpat Rai & Co.

3. Electrical Machines, S.K.Bhattacharya, T.M.H Publishing Co. Ltd.

Reference Books:

1. Electrical Machines, Nagrath & Kothary, TMH
2. Electrical Machines, Theory & Applications, M.N. Bandyopadhyay, PHI
3. The performance and design of Alternating Current machines, M.G.Say, C.B.S Publishers & Distributors
4. Electrical Technology, H.Cotton, C.B.S. Publisher New Delhi
5. Electric Machinery & Transformes, Irving L. Kosow, PHI
6. Electric Machinery, A.E.Fitzgerald, Charles Kingsley, Jr. & Stephen D. Umans, 6th Edition, Tata McGraw Hill Edition.
7. Problems in Electrical Engineering, Parker smith, 9th Edition, CBS publishers & distributors.

Paper Name: Power System-I

Paper Code: EE502

Total Contact Hours:

Credit: 4

Pre requisites:

Concepts of basic electrical engineering, circuit theory and electrical machine.

Course Objective:

To teach and learn basic structure of power system networks and generation of power.

To teach and learn of different power system components and stability analysis.

Course Outcome:

COs	CO Statement
EE502.1	Understand the concept of power system, know various power system components and define associated terms.
EE502.2	Know different type of power generation
EE502.3	Understand basic performances of power system

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											L
CO2	M											
CO3	M											

Course contents:

Module 1

Basic Concept of Electrical Supply System:

Structure of Power system, basic idea of transmission, distribution, tie lines, Grid networks etc

2

Module 2

Generation of Electric Power:

General layout of a typical coal fired power station, Hydro electric power station, and Nuclear power station, their components and working principles, comparison of different methods of power generation, Introduction to Solar & Wind energy system.

6

Module 3

Mechanical Design of Overhead transmission line: Design of Conductors, Line supports:- Towers, Poles,

Insulators: Types, Voltage distribution across a suspension insulator string, String efficiency, Arching shield & rings, Methods of improving voltage distribution across Insulator strings, Electrical tests on line Insulators

Sag, Tension and Clearance, Effect of Wind and Ice on Sag, Stringing Chart Dampers

6

Module 4

Electrical Design of Overhead transmission line: Choice of frequency, Choice of voltage, Types of conductors, Inductance and Capacitance of a single phase and three phases' symmetrical and unsymmetrical configurations. Bundle conductors. Transposition. Concept of GMD and GMR. Influence of Earth on conductor capacitance

8

Module 5

Corona: Principle of Corona formation, Critical disruptive voltage, Visual critical corona discharge potential, Corona loss, advantages & disadvantages of Corona. Methods of reduction of Corona

4

Module 6

Cables: Types of cables, cable components, capacitance of single core & 3 core cables, dielectric stress, optimum cable thickness, grading, dielectric loss and loss angle.

4

Module 7

Performance of lines: Short, medium (nominal , T) and long lines and their representation. A.B.C.D constants, Voltage regulation, Ferranti effect, Power equations and line compensation, Power Circle diagrams.

8

Module 8

Tariff:

Introduction of Economics of power.

Guiding principle of Tariff, different types of tariff. Indian Electricity Rule-1956 &2003: General Introduction

Paper Name: CONTROL SYSTEMS-I

Paper Code: EE503

Total Contact Hours: 36

Credit: 4

Pre requisites:

Concept of basic electrical engineering, circuit theory and Engineering Mathematics.

Course Objective:

Find the utility to understand the concept of advance control system.

Course Outcome:

Remembering	EE503.1	Get knowledge of basic structure of control systems, define basic terminologies, components
Understanding	EE503.2	Modeling physical systems using transfer function to analyze system dynamic and steady state behavior
Understanding	EE503.3	Understand the concept of feedback system and controllers, design compensators in frequency domain

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											
CO2	M											
CO3	H	M	L									L

Course contents:

Introduction to control system: Concept of feedback and Automatic control, Types and examples of feedback control systems, Definition of transfer function .Poles and Zeroes of a transfer function. [2]

Mathematical modeling of dynamic systems: Writing differential equations and determining transfer function of model of various physical systems including -Translational & Rotational mechanical systems, Basic Electrical systems & transfer function , Liquid level systems, Electrical analogy of Spring–Mass-Dashpot system. Block diagram representation of control systems. Block diagram algebra. Signal flow graph. Mason's gain formula.[6]

Control system components: Potentiometer, Synchros, Resolvers, Position encoders. DC and AC tacho-generators. Actuators. [2]

Time domain analysis: Time domain analysis of a standard second order closed loop system. Determination of time-domain specifications of systems. Step and Impulse response of first and second order systems. Stability by pole location. Routh-Hurwitz criteria and applications. Control Actions: Basic concepts of PI, PD and PID control, Steady-state error and error constants[8]

Stability Analysis by Root Locus method: Root locus techniques, construction of Root Loci for simple systems. Effects of gain on the movement of Pole and Zeros.[4]

Frequency domain analysis of linear system: Bode plots, Polar plots, Nichols chart, Concept of resonance frequency of peak magnification. Nyquist criteria and Nyquist plots, measure of relative stability, phase and gain margin. Determination of margins in Bode plot[8]

Control System performance: Improvement of system performance through compensation. Lead, Lag and Lead- lag compensation. [4]

Case-studies: Block diagram level description of feedback control systems for position control, speed control of DC motors, temperature control, liquid level control, voltage control of an Alternator.[4]

Numerical problems to be solved in the tutorial classes.

Total 36 contact hours for the semester

Text books:

1. Modern Control Engineering, K. Ogata, 4th Edition, Pearson Education.

2. Control System Engineering, I. J. Nagrath & M. Gopal. New Age International Publication.

3. Control System Engineering, D. Roy Choudhury, PHI

4. Automatic Control Systems, B.C. Kuo & F. Golnaraghi, 8th Edition, PHI

Reference Books:

1. Control Engineering Theory & Practice, Bandyopadhyaya, PHI

2. Control systems, K.R. Varmah, Mc Graw hill

3. Control System Engineering, Norman Nise, 5th Edition, John Wiley & Sons

4. Modern Control System, R.C. Dorf & R.H. Bishop, 11th Edition, Pearson

Education.

Reference Books:

1. Matlab & Simulink for Engineers, Agam Kumar Tyagt, Oxford

2. Modeling & Simulatrion using Matlab-Similink, Dr. S. Jain, Wiley India

3. Matlab & its application in Engineering, Raj K Bansal, A.K. Goel & M.K.

Sharma, Pearson

MATLAB programming for Engineers, S.J. Chapman, 3rd Edition, Cengage.

Paper Name: Microprocessor and Microcontroller

Paper Code: EE504

Contact: 3P

Credits: 3

Prerequisites: Knowledge in Digital Electronics

Course Objective:

To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

Course Outcome:

CO	Statement
CO1	Able to correlate the architecture , instructions, timing diagrams, addressing modes, memory interfacing, interrupts, data communication of 8085
CO2	Able to interprete the 8086 microprocessor-Architecture, Pin details, memory segmentation, addressing modes, basic instructions, interrupts

CO3	Recognize 8051 micro controller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts
CO4	Apply instructions for assembly language programs of 8085, 8086 and 8051
CO5	Design peripheral interfacing model using IC 8255, 8253, 8251 with IC 8085, 8086 and 8051.

Course Contents:

Module 1:

8085 Microprocessor: Introduction to Microcomputer based system, Evolution of Microprocessor and microcontrollers and their advantages and disadvantages, Architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing, Status and Control signal generation, Instruction set of 8085 Microprocessor, Classification of instructions, addressing modes, timing diagram of the instructions, Memory interfacing , IO interfacing, ADC / DAC interfacing, Stack and Subroutine, Delay Calculation, Interrupts of 8085 processor, classification of interrupts, Serial and parallel data transfer – Basic concept of serial I/O, DMA, Asynchronous and synchronous serial transmission using SID and SOD pins of 8085. 12L

Module 2:

Assembly language programming with 8085: Addition,Subtraction,Multiplication, Block Transfer, Ascending order, Descending order, Finding largest & smallest number, Look-up table etc. Programming using interrupts (programming using INTR is not required). 2L

Module 3:

8086 Microprocessor: 8086 Architecture, Pin details, memory segmentation, addressing modes, Familiarization of basic Instructions, Interrupts, Memory interfacing, ADC / DAC interfacing. 5L

Module 4:

Assembly language programming with 8086: Addition, Subtraction, Multiplication, Block Transfer, Ascending order, Descending order, Finding largest & smallest number etc. 2L

Module 5:

8051 Microcontroller: 8051 architecture, hardware, input/output pins, ports, internal and external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts, Memory interfacing, ADC / DAC interfacing. 4L

Module 6:

Assembly language Programming using 8051: Moving data: External data moves, code memory read only data moves, PUSH and POP opcodes, data exchanges; Logical operations: Byte-level, bit-level, rotate and swap operations; Arithmetic operations: Flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic; Jump and call instructions: Jump and call program range, jumps, calls and subroutines, interrupts and returns.
3L

Module 7:

Support IC chips: 8255, 8253 and 8251: Block Diagram, Pin Details, Modes of operation, control word(s) format. Interfacing of support IC chips with 8085, 8086 and 8051. 6L

Module 8:

Brief introduction to PIC microcontroller (16F877): Architecture, PIN details, memory layout.
1L

Text Books:

Microprocessor architecture, programming and application with 8085 – R. Gaonkar, Penram International

The 8051 microcontroller - K. Ayala ,Thomson

Microprocessors & interfacing – D. V. Hall ,Tata McGraw-hill

Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH

The 8051 microcontroller and Embedded systems - Mazidi, Mazidi and McKinley, Pearson

An Introduction to Microprocessor and Applications –Krishna Kant,Macmillan

References:

Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan,Oxford university press

8086 Microprocessor –K Ayala, Cengage learning

The 8051 microcontrollers – Uma Rao and Andhe Pallavi ,Pearson

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC502.1	3	3	2	2	-	2	-	-	-	-	-	3
EC502.2	3	3	2	2	-	2	-	-	-	-	-	3
EC502.3	3	3	2	2	-	2	-	-	-	-	-	3
EC502.4	3	3	3	3	-	2	-	-	-	-	-	3
EC502.5	3	3	3	3	-	2	-	-	-	-	-	3
3	3	2	2	-	2	-	-	-	-	-	3	

Paper Name: ELECTRICAL MACHINES – II LAB

Paper Code: EE591

Total Contact Hours: 36

Credit: 2

Pre requisites:

Concepts of electrical machine.

Course Objective:

Provide knowledge to select the fractional kW motors for particular machine.

Study the performance of synchronous machine.

Course Outcome:

Remembering	EE591.1	Perform different tests on synchronous machine and single phase induction motor
Understanding	EE591.2	Interpret the observed result using theoretical knowledge and hence calculate unknown parameters

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H					H	M		
CO2	M			H					H	M		

Course contents:

List of Experiments:

To observe the effect of excitation and speed on induced e.m.f of a 3-phase alternator and plot the O.C.C. of the alternator.

Determination of regulation of Synchronous machine by

Potier reactance method.

Synchronous Impedance method

To determine the direct axis resistance [Xd] and quadrature reactance [Xq] of a 3-phase synchronous machine by slip test.

Parallel operation of 3 phase Synchronous generators.

V-curve of Synchronous motor.

Determination of equivalent circuit parameters of a single phase Induction motor.

Load test on single phase Induction motor to obtain the performance characteristics.

To study the performance of Induction generator.

To study the effect of capacitor on the starting and running condition of a single-phase Induction motor, and to determine the method of reversing the direction of rotation.

Paper Name: Power System-I LAB

Paper Code: EE592

Total Contact Hours:

Credit: 2

Pre requisites:

Concept of Power System.

Course Objective:

To allow student to practically verify several concepts and procedures learn in power system modelling and analysis.

Course Outcome:

COs	CO Statement
EE 502.1	Able to estimate performance of Transmission Line and Distribution line
EE502.2	Able to select line support for a particular TL
EE502.3	Able to explain methods of active and reactive power control.
	Able to test the reliability of different components of TL and Distribution Line

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H					H	M		
CO2	M			H					H	M		
CO3	M			H					H	M		
CO4	M			H					H	M		

Course contents:

1. Draw the Schematic diagram of structure of power system and power transmission line and Symbol of Electrical Equipments.

2. Simulation of DC distribution by network analyzer.

3. Measurement of earth resistance by earth tester.

4. Dielectric strength test of insulating oil, solid Insulating Material.

5. Different parameter calculation by power circle diagram

6. Study of different types of insulator.

7. Determination of the generalized constants A.B, C, D of long transmission line.

8. Active and reactive power control of alternator.

9. Study and analysis of an electrical transmission line circuit with the help of software.

10. Dielectric constant, tan delta, resistivity test of transformer oil.

11. Any Innovative experiment according to knowledge of power System I

Paper Name: CONTROL SYSTEM-I LAB

Paper Code: EE593

Total Contact Hours:

Credit: 2

Pre requisite

Concept of Simulation Software and control system.

Course Objective:

Provide knowledge of basics of control system and learning of different systems with their stability analysis.

Course Outcome:

COs	CO Statement
EE503.1	Simulate, analyze system behavior using software simulator/hardware
EE503.2	Design compensators, controllers to meet desired performance of system.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			H					H	M		
CO2	M			H					H	M		

Course contents:

1. Familiarization with MAT-Lab control system tool box, MAT-Lab- simulink tool box & PSPICE

2. Determination of Step response for first order & Second order system with unity feedback on CRO &

calculation of control system specification like Time constant, % peak overshoot, settling time etc. from the

response.

3. Simulation of Step response & Impulse response for type-0, type-1 & Type-2 system with unity feedback using

MATLAB & PSPICE.

4. Determination of Root locus, Bode plot, Nyquist plot using MATLAB control system tool box for 2nd order

system & determination of different control system specification from the plot.

5. Determination of PI, PD and PID controller action of first order simulated process.

6. Determination of approximate transfer functions experimentally from Bode plot.

7. Evaluation of steady state error, setting time , percentage peak overshoot, gain margin, phase margin with

addition of Lead

Reference Books:

1. Matlab & Simulink for Engineers, Agam Kumar Tyagt, Oxford

2. Modeling & Simulatrion using Matlab-Similink, Dr. S. Jain, Wiley India

3. Matlab & its application in Engineering, Raj K Bansal, A.K. Goel & M.K.

Sharma, Pearson

4. MATLAB programming for Engineers, S.J. Chapman, 3rd Edition, Cengage.

Paper Name: Microprocessor and Microcontroller Lab

Paper Code: EE594

Contact: 3P

Credits: 2

Prerequisites: Knowledge in Digital Electronics

Course Objective:

To apply ALP Programming for arithmetic-logical solutions and also to interpret the interfacing programming by conducting experiments.

Course Outcome:

CO	Statement
CO1	Able to solve small assignments using the 8085 basic instruction sets and memory mapping through trainer kit and simulator.
CO2	Able to write 8085 assembly language programs like Addition, Subtraction, Multiplication, Square, Complement, Look up table, Copying a block of memory, Shifting ,Packing and unpacking of BCD numbers, Ascending order, Descending order etc. using trainer kit.
CO3	Able to validate the interfacing technique using 8255 trainer kit through subroutine calls and IN/OUT instructions like glowing LEDs accordingly, stepper motor rotation etc.

CO4	Able to test fundamental of 8051 programs using the trainer kit.

Course Contents:

Familiarization with 8085 register level architecture, the basic instruction sets (data transfer, arithmetic, logical, branching) and the trainer kit components including the memory map.

Familiarization with the process of storing, executing and viewing the contents of memory as well as registers in the trainer kit 8085 and simulator through small assignments.

Programming using 8085 kit and simulator for:

Addition, Subtraction, Multiplication by repeated addition method, Square, Complement, Look up table, Copying a block of memory, Shifting ,Packing and unpacking of BCD numbers, Addition of BCD numbers, Binary to ASCII conversion, Smallest and Largest number from an array of numbers, Ascending order, Descending Order, String Matching, Multiplication using shift and add method.

Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit e.g. subroutine for delay, reading switch state and glowing LEDs accordingly, glowing of seven segment display.

Program for serial communication between two trainer kits.

Interfacing of 8255: Keyboard, Stepper motor rotation.

Study of 8051 Micro controller kit and writing programs.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC592.1	2	2	1	1	1	1	1	1	3	1	1	3
EC592.2	3	3	3	3	2	1	1	1	3	2	2	3

EC592.3	3	3	3	3	2	2	1	1	3	2	2	3
EC592.4	3	3	2	2	2	1	1	1	3	1	2	3

Paper Name: Electrical System Design

Paper Code: EE581

Contact: 3P

Credits: 2

Prerequisites: Knowledge of applications of Electrical Circuit, devices and machines

Course Objective:

To develope confidence in young professionals in electrical system design.

Course Outcome:

CO	Statement
CO1	Able to design electrical systems.
CO2	Able to develope an idea of preparing bill of materials for a particular design.

List of experiments

1.Familiarization of synchronous machine , single phase and three phase induction machine , DC machine, single phase and three phase transformers with the help of cut section models.

2. Design and fabrication of air and iron cored inductor.

3. Designing a heating element with specified wattage, voltage and ambient temperature.

4. Designing a split phase squirrel cage induction motor for a ceiling fan or domestic pump.

5. Design and fabrication of small single phase transformer, 100VA, 220/12V

6. Wiring and installation design of multistoried residential building(G+4, not less than 16 dwelling flats with lift and common pump)

7. Designing of power distribution system for a small township.

8. Designing of a substation.

9. Introduction to computer aided machine design.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE581.1	2	2	1	1	1	1	1	1	3	1	1	3
EE581.2	3	3	3	3	2	1	1	1	3	2	2	3

3rd Year, 6th SEMESTER

Sl. No.		Code	Paper	Contact Periods Per Weeks	Total Contact Hours	Credit

				L	T	P	S		
THEORY:									
1	PC	EE601	Control Systems-II	3	0	-	-	3	3
2	PC	EE602	Power Systems-II	3	0	-	-	3	3
3	PC	EE603	Power Electronics	3	0	-	-	3	3
4	PC	EC(EE)604	Digital Signal Processing*	3	0	0	0	3	3
5	PE	EE 605	Elective I a. Non-conventional Energy Sources and Applications b. Computational Intelligence c. Introduction to Robotics d. Mechatronics	3	1	0	0	4	4
6	OE	CS (EE)606	Elective-II a. Introduction to programming in JAVA	3	0	0	-	3	3

			b. Object oriented Programming using C++ c. Computer architecture and operating systems d. Software Engineering						
PRACTICAL :									
1	PC	EE691	Control System-II Lab	0	0	3	0	3	2
2	PC	EE692	Power Systems-II Lab	0	0	3	0	3	2
3	PC	EE693	Power Electronics Lab	0	0	3	0	3	2
4	PW	EE 681	Electrical System Design –II	0	1	3	0	4	2
5	OE	CS (EE)606	Elective-II	0	0	2	0	2	1
6	PW	EE 671	Industrial Training					4 week	2
		Total Theory						19	19
		Total Practical/ Sessional						15	11

	TOTAL	34	30

Paper Name: CONTROL SYSTEMS-II

Paper Code: EE 603

Total Contact Hours: 40

Credit: 4

Prerequisite: Any introductory course on matrix algebra, calculus, Engineering Mechanics.

Course Objective: The purpose of this course is to provide :

Fundamental concepts OF STATE VARIABLE MODEL OF CONTINUOUS DYNAMIC SYSTEM.

Knowledge of sampled data systems using Z transform, inverse z transform and stability in z domain.

Basic knowledge of nonlinear systems with stability analysis using different methods.

Course outcome:

EE601.1: express and solve system equations in state-variable form (state variable models).

EE601.2: Students will be able to analyze and design of discrete time control systems using z transform.

EE601.3: Students will be able to examine the stability of nonlinear systems using appropriate methods.

Course contents:

MODULE I [15L]

State variable model of continuous dynamic systems:

Converting higher order linear differential equations into state variable form. Obtaining SV model from transfer functions. Obtaining characteristic equation and transfer functions from SV model. Obtaining SV equations directly for R-L-C and spring-mass-dashpot systems.

Concept and properties associated with state equations. Linear Transformations on state variables. Canonical forms of SV equations. Companion forms. Solutions of state equations, state transition matrix, properties of state transition matrix.

Controllability and observability. Linear State variable feedback controller, the pole allocation problems. Linear system design by state variable feedback.

MODULE II [10L]

Analysis of discrete time (sampled data) systems using Z-transform:

Difference Equations. Inverse Z transform. Stability and damping in z-domain. Practical sampled data systems and computer control. Practical and theoretical samplers. Sampling as Impulse modulation. Sampled spectra and aliasing. Anti-aliasing filters. Zero order hold. Approximation of discrete (Z-domain) controllers with ZOH by Tustin transform and other methods. State variable analysis of sampled data system. Digital compensator design using frequency response.

MODULE II [15L]

Introduction to non-linear systems:

Block diagram and state variable representations. Characteristics of common nonlinearities.Phase plane analysis of linear and non-linear second order systems. Methods of obtaining phase plane trajectories by graphical method – isoclines method. Qualitative analysis of simple control systems by phase plane methods. Describing Function method. Limit cycles in non-linear systems. Prediction of limit cycles using describing function.Stability concepts for nonlinear systems. BIBO vs. State stability. Lyapunov's definition. Asymptotic stability, Global asymptotic stability. The first and second methods of Lyapunov methods to analyze nonlinear systems.

Text Books

1. Gopal M : Digital Control and State Variable Methods, 2e, – TMH

2. Roy Choudhuri, D., Control System Engineering, PHI

3. Nagrath I J & Gopal M : Control Systems Engg. - New Age International

4. Anand,D.K, Zmood, R.B., Introduction to Control Systems 3e, (Butterworth-Heinemann)Asian

Books

Reference Books:

1. Goodwin, Control System Design, Pearson Education

2. Bandyopadhyaya, Control Engg.Theory and Practice, PHI

3. Kuo B.C. : Digital Control System- Oxford University Press.

4. Houpis, C.H, Digital Control Systems, Mc Graw Hill International.

5. Ogata, K., Discrete Time Control Systems, Prentice Hall, 1995

6. Jury E.I. : Sampled Data Control System- John Wiley & Sons Inc.

7. Umez-Eronini, Eronini., System Dynamics and Control, Thomson

8. Dorf R.C. & Bishop R H : Modern Control System- Pearson Education.

9. Ramakalyan, Control Engineering, Vikas

10. Natarajan A/Reddy, Control Systems Engg., Scitech

11. Lyshevski, Control System Theory with Engineering Applications, Jaico

12. Gibson J E : Nonlinear Control System - McGraw Hill Book Co.

CO-PO mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EE601.1	3	1	-	-	-	1	-	-	-	-	-	2
EE601.2	3	2	-	-	-	-	-	-	-	-	-	1
EE601.3	3	2	2	-	-	-	-	-	-	-	-	1

Paper Name: Power System –II

Paper Code: EE602

Total Contact Hours: 44

Credit: 4

Prerequisite: Power System 1, Machine-I, Basic Electrical, Circuit theory.

Course Objective: The purpose of this course is to provide knowledge of advance structure of power and power network and analysis of complex power network by different load flow methods and get a clear idea about different types of power system faults and protection schemes. By end of the course, the students should be able to gather high quality of electrical power system engineering in above mentioned fields.

Course outcome:

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

Course Outcome:-

EE 602.1: Learn about advance structure of power system.

EE 602.2: Get depth knowledge of different types of power system protection, fault, stability analysis and load flow method.

EE 602.3: Design and analysis of different types of substation and implement these ideas in industry or real life problem solve.

Course contents:

MODULE I [6L]

Representation of Power system components:

Single-phase representation of balanced three phase networks, the one-line diagram and the

Impedance or reactance diagram, per unit (PU) system.

Distribution substation:

Types of substations, location of substations, substation equipments and accessories,

Earthling (system & equipment), feeder and distributors, radial and loop systems.

MODULE II [2L]

Basic Idea of Real and Reactive Power Control:

Introduction to Real and Reactive Power Control (SMIB)Single machine connected to Infinite Bus..

MODULE III [8L]

Load flow studies:

Network model formulation, formation of Ybus , load flow problem, Gauss-Siedel method,

Newton-Raphson method, Decoupled load flow studies with flowchart, comparison of load flow methods.

MODULE IV [4L]

Power system stability:

Steady state stability, transient stability, equal area criteria, swing equation, multi machine

Stability concept, Introductory idea of Voltage Stability and Voltage Collapsed

MODULE V [8L]

Faults in Electrical systems:

Transient on a transmission line, short circuit of a synchronous machine under no load &

Loaded condition. Symmetrical component transformation, sequence impedance and sequence network of power system, synchronous machine, transmission lines and transformers.

Symmetrical component analysis of unsymmetrical faults, single line-to –ground fault, line to-line fault, double line-to- ground fault.

MODULE VI [16L]

Power system protection:

i) Operating Principles and Relay Constructions

Functions of protective Relaying, different terminologies used in protective relaying, Basic Operation of relay, Electromagnetic Attraction Relays (Plunger type, Hinged armature type, Balanced beam type, Polarized moving iron type) advantages, disadvantages, applications of Electromagnetic attraction relays.

Electromagnetic Induction type relays, theory of Induction relay torque, Induction Type Over current relay (non-directional), Induction Type Directional Power Relay, Directional over current relay. Distance Relay(Impedance relays, Reactance relay, MHO relay),Differential relay(Current differential relay, Voltage Balance Differential relay) Tran slay relay, Directional relay(Single phase directional relays),Negative Sequence Relays, Under Frequency Relays, over current Relays, Static Relays(Transductor relays, rectifier bridge relays, Transistors relays, Hall effect relays, Gauss effect relays).Over current Relays(Static time over current relays, Directional Static over current relay, static differential relay, static distance relays, Microprocessor Based relays, Universal relay torque equations, protection scheme for transformer, generators , motors, Bus Zone Protection, Protection of Transmission lines, C.T s and P.T s and their applications in the protective Schemes .Static Relays and Numerical Protections.

ii) Construction and operating principle of circuit Breaker:-

Brief description of Circuit Breakers, Operating principle of Circuit breaker, Arc Phenomenon, principles of Arc Extinction, methods of arc Extinction, Voltage breaking transients, transient recovery voltage, current chopping and resistance switching, circuit breaker rating, arc and arc extinction, circuit breaker types, oil circuit breaker, vacuum circuit breaker, air blast circuit breaker, SF6 circuit breaker and

Operating mechanism, advantages and disadvantages of different types of circuit breaker. Testing of Circuit Breakers.

Numerical problems to be solved in the tutorial classes.

Text Books:

1. Electrical Power System, Subir Roy, Prentice Hall

2. Power System Engineering, Nagrath & Kothery, TMH

3. Elements of power system analysis, C.L. Wodhwa, New Age International.

4. Electrical Power System, Ashfaq Hussain, CBS Publishers & Distributors

5. Principles of Power System .V.K.Mehta and Rohit Mehta ,S.Chand.

Reference Books:

1. Electric Power transmission & Distribution, S.Sivanagaraju, S.Satyanarayana,

Pearson Education.

2. A Text book on Power system Engineering, Soni, Gupta, Bhatnagar & Chakrabarti,

Dhanpat Rai & Co.

3. Power System Protection and Switchgear, Badri Ram,TMH

4. Electric Power distribution system Engineering, 2nd Edition, T. Gonen, CRC Press.

4. www.powermin.nic.in/acts_notification/pdf/ier1956.pdf

Course Outcome Statement:

	Bloom Taxonomy	
EE602.1	Understanding	Understand and explain the balanced three phase networks, per unit (PU) system, representation of one-line diagram, power system stability
EE602.2	Evaluating	Apply the knowledge of load flow solution technique and solve problem load flow analysis using Gauss-Siedel method, Newton-Raphson method under loaded and unloaded conditions and analyse different power system faults(Symmetrical and unsymmetrical)
EE602.3	Analysing	Understand and explain the principle of operation and performance of different types of relay, circuit breakers and implies it in different protection scheme.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

	Bloom Taxonomy	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	Understanding	H			H								L
CO 2	Evaluating		H	M	H								L
CO 3	Analysing	H		M			M						L

CO-PO mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EE602.1	3	-	-	3	-	-	-	-	-	-	-	1
EE602.2	-	3	2	3	-	-	-	-	-	-	-	1
EE 602.3	3	-	2	-	-	2	-	-	-	-	-	1

3=High,2=Medium,1=Low

Course Name: Power Electronics

Course Code: EE603

Course Credit: 4

Contact Hour: 3L-1T

Prerequisite: Concept of Basic Electronics

Course Objective

The objectives of this course are

Ability to understand and explain the principle of operation and performance of different power electronics devices.

Ability to prepare the students to analyze and design different power converter circuits.

Ability to troubleshoot the operation of different power semiconductor devices.

Ability to study the various applications of power electronics to practical industrial applications, home appliances, power supply and controlling the flow of power.

Course Outcome

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

PE603.1: Acquire knowledge about fundamental concepts and techniques used in power electronics.

PE603.2: Analyze various single phase and three phase power converter circuits and understand their applications.

PE603.3: Identify basic requirements for power electronics based design application.

PE603.4: Develop skills to build, and troubleshoot power electronics circuits.

PE603.5: Understand the use of power converters in commercial and industrial applications.

Course contents:

MODULE I [4L]

Introduction: Concept of power electronics, application of power electronics, uncontrolled converters, advantages and disadvantages of power electronics converters, power electronics systems, power diodes, power transistors.

MODULE II [7L]

Advances in Power Electronics Power Semiconductor Switches: Rectifier diodes, fast recovery diodes, Schottky barrier diode, BJT, Power MOSFET, SCR, TRIAC, IGBT,IGCT and GTO. Ratings, Static and Dynamic Characteristics, triggering and switching characteristics and cooling. SCR turn –on and turn -off methods, Triggering circuits, SCR Commutation circuits, SCR Series and Parallel operation, Snubber Circuit.

MODULE III [7L]

Phase controlled converters: Principle of operation of single phase and three phase half wave, half controlled, full controlled converters with R, R-L and RLE loads, effects of freewheeling diodes and source inductance on the performance of converters. Performance parameters of converters, Dual converters.

MODULE IV [5L]

DC-DC converters: Principle of operation, control strategies, Step up and Step down choppers, Buck, Boost, Buck - Boost and Cuk Converters, Concept of Resonant Switching.

MODULE V [6L]

Inverters: Principle of operation of single phase inverter, 120º and 180° conduction mode of operation of three phase inverter, performance parameters of inverters, PWM techniques, Sinusoidal PWM, modified Sinusoidal PWM - multiple PWM Voltage and harmonic Control, introduction to Space vector modulation method,Series resonant inverter-Current Sources Inverter.

MODULE VI [5L]

AC controllers: AC Voltage Controllers, Single phase and three phase Cycloconveters – Power factor control and Matrix Converters.

MODULE VII [6L]

Applications: Speed control of AC and DC motors. HVDC transmission. Static circuit breaker, UPS, static VAR controller.

Text Books:

1) P.C. Sen, Power Electronics.

2) M.H. Rashid, Power Electronics, PHI/ Pearson Education.

3) P.S. Bhimra, Power Electronics, Khanna Publications.

4) K. Hari Babu: Power Electronics

Reference Books:

1) C.W. Lander, Power Electronics, McGraw Hill.

2) B.K.Bose, Modern Power Electronics, JAICO.

3) Mohan, N Undeland, TM & Robbins, WP- Power Electronics, John Wiley & Sons.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
PE603.1	H	M										
PE603.2	M	H	L									
PE603.3			M		L							
PE603.4			M	M								
PE603.5	M		M	M	L							

Stream: EE

Paper Name: Digital Signal Processing

Paper Code: EC(EE)604

Contacts: 3L

Credits: 3

Total Contact: 35

Semester: 6th

Course Objectives:

To study the z-transform, convolution, correlation and applications of z -transform.

To introduce students with transforms for analysis of discrete time signals and systems.

To understand the digital signal processing, sampling and aliasing.

To use and understand implementation of digital filters.

To study filter design techniques.

To study Discrete Fourier Transforms.

To study Fast Fourier Transforms.

To study fixed point and floating point digital signal processors.

COURSE OUTCOMES:

Able to define discrete systems in the Frequency domain using Fourier analysis tools like DFT, FFT.

Able to interpret the properties of discrete time signals in time domain and frequency domain.

Able to describe finite word length effects and digital filters.

Able to analyse convolution for long sequences of data.

Able to implement digital filters.

PREREQUISITE:

Prerequisites for Digital signal Processing are required a thorough understanding of various signals, systems, and the methods to process a digital signal and also the knowledge of arithmetic of complex numbers and a good grasp of elementary calculus. The questions reflect the kinds of calculations that routinely appear in Signals. The candidates are expected to have a basic understanding of discrete mathematical structures.

The candidates required the concept of Z-transform, Relation between Fourier transform and Z transform, Properties of ROC and properties of Z transform, Initial value theorem and final value theorem, stability considerations for LTI systems using Z-transform, Perseval's relation, Inverse Z-transform by Residue method, power series & partial-fraction expansions.

MODULE – I

Discrete Fourier Transform and Fast Fourier Transform:

Definition of DFT and IDFT, Twiddle factors and their properties, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, aliasing error, filtering of long data sequences using Overlap-Save and Overlap-Add methods.

Difference between DFT and FFT. Radix-2 algorithm, Decimation-In-Time, Decimation-In-Frequency algorithms, signal flow graphs Butterflies, Bit reversal.

MODULE – II

Filter Design:

Basic concepts of IIR and FIR filters, difference equations, Realization of Filters using Direct form –I, II & Cascade Form Design of IIR Filter using impulse invariant and bilinear transforms, approximation & Design of analog Butterworth Filter, Design of linear phase FIR filters, Concept of Symmetric & anti-Symmetric FIR Filter , Various kinds of Window :Rectangular, Hamming and Blackman windows.

MODULE – III

Finite word Length Effects in Digital Filters:

Input Quantization error, Product Quantization error, Coefficient, Quantization error, Zero- input Limit cycle Oscillations, Dead band, limit cycle Oscillations.

MODULE – IV

Application of DSP:

Introduction to DSP Hardware TMS320C 5416/6713 processor. Concept of Sub-band coding, Speech analysis etc.

TEXT BOOKS:

Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.

Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.

Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).

Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.

REFERENCE BOOKS:

Digital Signal Processing; Spectral Computation and Filter Design Chi-Tsong Chen, Oxford University Press

Texas Instruments DSP Processor user manuals and application notes.

CO-PO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1	1	-	2	-	2	2	2	2	3
CO 2	3	2	2	1	2	3	-	2	2	1	2	3
CO 3	3	3	1	3	2	3	1	2	2	1	2	3
CO 4	3	2	1	3	-	3	1	3	1	1	1	3
CO 5	3	2	-	1	-	-	1	1	1	2	2	1
CO 6	3	3	3	-	3	3	2	3	3	2	3	2

Paper Name: Non-Conventional Energy sources and applications
Paper Code: EE605A
Total Contact Hours: 40
Credit: 4

Prerequisite: Any introductory course on non conventional energy resources and their application

Course Objective: The purpose of this course is to provide knowledge on different renewable energy sources for energy production for future growth and development.

Course outcome:

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

EE605A.1 Student will be able to understand the importance of Renewable energy over conventional process and learn different methods of Power generation from the Non- conventional sources like Solar, Wind Energy, Biomass, Geothermal energy, OTEC, Tidal energy ,MHD Power generation schemes.

EE605A.2: Students will be able to analyze the different techniques of grid integration of the power generated from renewable energy sources with the initiation of power electronic converters and drives.

EE605A.3 Students will be able to design different hybrid energy systems and energy storage systems.

Course contents:

MODULE 1: 2L

INTRODUCTION TO ENERGY SOURCES: 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, Kyoto Protocol.

MODULE 2 10L

SOLAR ENERGY

SOLAR ENERGY: 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.

SOLAR THERMAL SYSTEMS: Flat plate collectors, Concentrating collectors, 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 PHOTOVOLTAIC SYSTEMS–Theory of solar cells, different types of PV Cells, Mono-poly Crystalline and amorphous Silicon solar cells. Concept of module,array. Classification of PV systems, Advantages and limitations. Efficiency and cost of PV systems & its applications in battery charging, and Lighting.

MODULE 3 6L

WIND ENERGY: Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output from wind turbine; wind data and site selection considerations, characteristics of different types of wind generators used with wind turbines.

MODULE 4 : 5L

BIOMASS ENERGY

Biomass conversion technologies, Biogas generation plants, classification, advantages and disadvantages, constructional details, site selection, digester design consideration, filling a digester for starting, maintaining biogas production, Fuel properties of bio gas, utilization of biogas, Biodiesel

MODULE 5 **3L**

GEOTHERMAL ENERGY:

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

MODULE 6 **4L**

ENERGY FROM OCEAN:

Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC in India. Ocean Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation and scope of tidal energy. Wave energy and power from wave, wave energy conversion devices, advantages and disadvantages of wave energy.

MODULE 7 **3L**

MAGNETO HYDRODYNAMIC POWER GENERATION:

Principle of MHD power generation, Classification of MHD system, Design problems and developments, gas conductivity, materials for MHD generators and future prospects.

MODULE 8 **3L**

HYDROGEN ENERGY:

Introduction, Hydrogen Production methods, Hydrogen storage, hydrogen transportation, utilization of hydrogen gas,hydrogen as alternative fuel for vehicles.

MODULE 9 **2L**

FUEL CELL:

Introduction, Design principle and operation of fuel cell, Types of fuel cells, conversion efficiency of fuel cell, application of fuel cells, limitations and application of fuel cells.

MODULE 10 **2L**

HYBRID SYSTEMS:

Introduction to hybrid systems, Need for Hybrid Systems ,Different type of Hybrid systems like Diesel-PV, Wind-PV, Microhydel-PV, Biomass-Diesel systems.

Text Books

1. Non Conventional Energy Resources by S Hasan Saeed, D K Sharma
2. Non conventional Energy sources, G.D. Rai, Khanna Publishers
3. Non Conventional Energy Resources,B.H Khan, Mc Graw Hill Education(Chennai)

Reference Books

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi.
2. Non Conventional Energy Resources And Utilisation. Er R.K Rajput, S Chand Publishers.

CO/PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE605.1	3	3	3	1	1	2	3	-	-	-	3	3
EE605.2	3	1	2	2	1	3	3	-	-	-	3	2
EE605.3	2	2	2	-	-	2	3	-	-	-	3	2

Paper Name: Introduction to Robotics

Paper Code: EE 605C

Total Contact Hours: 34

Credit: 3

Prerequisite: Computer Programming and Problem Solving

Course Objective:

To develop the student’s knowledge in various robot structures and their workspace

To develop student’s skills in performing spatial transformations associated with rigid body motions.

To provide the student with some knowledge and skills associated with robot control.

Course outcome:

On successful completion of this course, students should have the skills and knowledge to:

COs	CO Statement
EE 605C.1	Demonstrate the basics knowledge and skills in practical robotics applications
EE 605C.2	Ability to apply mechanical structures of industrial robots and their operational workspace characteristics
EE 605C.3	Students will demonstrate knowledge of robot controllers.
EE 605C.4	Understand and demonstrate an ability to simulate, program, and control commercial Robots through hands-on experiments
EE 605C.5	Understand industrial environment for robotics system

Course contents:

MODULE I [3L]

Introduction - Introduction to Robotics, brief history, types, classification and usage, The Engineering Design Process, Science and Technology of robots, Some useful websites, textbooks and research journals.

MODULE II [2L]

Elements of Robots -joints, links - Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms,

MODULE III [4L]

Actuators & Sensors - Different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.

MODULE IV [4L]

Introduction to Robot Mechanics- Power and torque, Acceleration and velocity, Design models for ground mobile robots, Design models for mechanic arms and lifting systems

MODULE V [4L]

Fundamentals of kinematics - Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures using theory of elimination, Inverse kinematics solution for the general 6R serial manipulator.

MODULE VI [6L]

Velocity and statics of robot manipulators - Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom, Statics of serial and parallel manipulators, Statics and force transformation matrix of a Gough-Stewart platform, Singularity analysis and statics.

MODULE VII [6L]

Motion planning and control - Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators

MODULE VIII [5L]

Advanced topics in robotics - Sensing distance and direction, Line Following Algorithms, Feedback Systems, Other topics on advance robotic techniques

Text books :

John J. Craig : Mechanics and Control (3rd Edition) 3rd Editio

Schilling: Fundamentals Of Robotics - Analysis And Control Paperback – 2006

Frank Casale (Author), Rebecca Dilla (Author): Introduction to Robotic Process Automation: a PrimerKindle Edition

Reference books:

Robotics: Fundamental Concepts and Analysis, Oxford University Press, Second reprint, May 2008.

Research work of my students and recent papers as mentioned in modules.

Material from other textbooks and robotics journals as mentioned.

All modules have Additional Material for self-study and reference

CO-PO mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12

EE 605C.1	3	-	2	1	-	-	-	-	-	-	-	-
EE 605C.2	3	3	2	-	-	-	-	-	-	-	-	1
EE 605C.3	2	-	-	-	2	-	-	-	-	-	-	1
EE 605C.4	2	2	-	2	-	1	-	-	-	-	-	-
EE 605C.5	2	-	2	-	-	-	1	-	-	-	-	1

Course Name: MECHATRONICS

Course Code : EE605D

Course Credit: 3

Contact Hour: 33

Course Instructor: Mr. Biswamoy Pal

Prerequisite: Electronics, Basics of Electrical & Mechanical Engineering, Control System I

Course Content:

Module1:Introduction (2):

Introduction to Mechatronic & measurement systems, Evolution, Scope, components of mechatronic systems, advantages & disadvantages,examples, Control Systems, open and close loop systems, sequential controllers, microprocessor based controllers, mechatronics approach.

Module2: Review of basic Electronics (4):

Review of fundamentals of electronics, logic gates and their operations, Data conversion devices, electrical contacts, actuators, and switches, contactless input devices, signal processing devices,Data Acquisition systems.

Module3: Sensors and transducers (6):

Introduction, performance terminology-Displacement, Position and Proximity, Velocity and motion, force, flow sensor,Temperature Sensors-Light Sensors, LVDT, Strain gauge load cell,Selection of Sensors-Signal Processing.

Module4: Actuation System (6):

Pneumatic and Hydraulic Systems – Directional Control Valves,Rotary Actuators.

MechanicalActuation Systems – Cams – Gear Trains – Ratchet and pawl – Belt and Chain Drives – Bearings.

Electrical Actuation Systems – Mechanical Switches – Solid State Switches – Solenoids – relays. Constructionand working principle of DC and AC Motors.speed control of AC and DC drives, Stepper Motors-switching circuitries for stepper motor – AC & DC Servo motors

Module6: Controllers (6):

Continuous and discrete process Controllers– Control Mode – Two – Step mode –Proportional Mode – Derivative Mode– Integral Mode – PIDControllers – Digital Controllers – Velocity Control – Adaptive Control – Digital Logic Control.

Microprocessor based Temperature control, Stepper motor control, Traffic light controller.

Module7: Programmable Logic Controller (5)- Introduction, Basic structure, Input/ Output Processing, Programming, Mnemonics, Timers, Internal relays and counters, Data handling, Analog Input/Output, Selection of a PLC.

Module8: Application of Robots and other mechatronic Applications(5):

Handling, loading, & unloading, Welding, Spray painting, Assembly, Machining, Inspection, Rescue robots, Underwater robots, Parallel robot, and Medical robot. Electronic Thermostat, Automatic Camera, Air fuel ratio controller in Automobiles, Digital Engine Control, Vehicle Motion Control, Mobile robots etc.

Text/Reference Books:

1. Bolton W., “Mechatronics”, Longman, Second Edition, 2004.

2. Histand Michael B.& Alciatore David G., “Introduction to Mechatronics & Measurement Systems”, McGraw Hill, 2003.

3. HMT Ltd., “Mechatronics”, Tata McGraw Hill Publishing Co. Ltd., 1998.

4. Nitaigour Premchand Mahalik, “Mechatronics Principles, Concepts * Applications”, TMH 2003.

Course Objective

The course objectives are:

To provide with basic knowledge of sensors, actuators, their control and robotics.

To make students understand about the process of integration of sensors & actuators, control sytem, signal processing, power electronics to perform complex tasks.

To make students familiar with real time controller operation.

Course Outcome

After successful completion of the course students:

CO 1: Can realize the importance of mechatronic system to perform complex tasks, can elaborate the step wise integration of sensors & actuators, control sytem, signal processing, power electronics.

CO 2: will be able to demonstrate basic operations of PLC , different control theory and understand mechatronic applications .

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EE 605D.1	3	-	2	1	-	-	-	-	-	-	-	-
EE	3	3	2	-	-	-	-	-	-	-	-	1

605D.2												

Introduction to JAVA

Code: CS(EE)606A

Contact: 3L

Credits: 3

Total Lectures: 36

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Objective(s)

It demonostrates 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)

Outcome(s)

Design the process of interaction between Objects, classes & methods w.r.t. Object Oriented Programming using java.

Acquire a basic knowledge of Object Orientation with different properties as well as different features of Java.

Analyze various activities of different string handling functions with various I/O operations.

Discuss basic Code Reusability concept w.r.t. Inheritance, Package and Interface.

Implement Exception handling, Multithreading and Applet (Web program in java) programming concept in Java.

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 Outcomes (CO) and Intended Learning Outcomes (ILO):

After successful completion of this course, the students should be able to

CO1:	Design the process of interaction between Objects,classes & methods w.r.t. Object Oriented Programming ILO1: Understand basic idea about of Object Oriented Analysis & Design (OOAD) ILO2: Acquire a basic knowledge of Object Orientation with different properties as well as different features of Java. ILO3: Realize the concepts of Object and Class in OOP ILO4: Comprehend different types of Object oriented Programming. ILO5: Understand the properties of OOP e.g. Encapsulation, Abstraction, Inheritance, Polymorphism etc.

CO2:	Acquire a basic knowledge of Object Orientation with different properties as well as different features of Java. ILO1: Understand the concepts of byte code & JVM, data types, access specifiers, operators, control statements & loops, array ILO2: Realize the perceptions of creating a class, defining objects, constructor ILO3: Examine the use of method overloading, this keyword, call by value & call by reference, static keyword. ILO4: Analyze memory dereferencing with garbage collection&finalize method. ILO5: Understand the basics of nested & inner class.
CO3	Analyze various activities of different string handling functions with various I/O operations. ILO1: Analyze the concepts of mutable and immutable Strings and different String handling mechanisms. ILO2:Comprehend different types of String class related methods with String Buffer class related methods. ILO3: Understand the basics of I/O operations using Buffered Reader. ILO4:Discuss the implementation technique of Scanner classes. ILO5:Understand Command Line arguments.
CO4:	Discuss basic Code Reusability concept w.r.t. Inheritance, Package and Interface ILO1: Describe the concepts of Superclass & Subclass including different types of inheritance, constructor calling in Inheritance, super and final keywords, super() method. ILO2: Understand Method overriding with dynamic method dispatch.

	ILO3: Deliberate the ideas of abstract classes, abstract methods & interfaces. ILO4: Analyze Multiple inheritance with the help of interfaces. ILO5: Discuss the creation of package, importing package and member access for packages.
CO5:	Implement Exception handling, Multithreading and Applet (Web program in java) programming concept in Java ILO1: Discuss the basics of exception handling, different types of exception classes, ILO2: Analyze the use of try & catch with throw, throws and finally, user defined exception classes. ILO3: Understand the concepts multithreading, main thread, thread life cycle, creation of thread, thread priorities ILO4: Comprehend the notions of thread synchronization, inter-thread communication, deadlocks for threads, suspending and resuming threads ILO5: Perceive the ideas of applet programming, applet life cycle, applet vs. application programming.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1 K=3	PO2 K=4	PO3 K=5	PO4 K=6	PO5 K=6	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1 K=2	S(1)	S(2)	M(3)									
CO2 K=1	S(2)	M(3)										
CO3 K=4	S(1)	S(0)	S(1)				M		M			
CO4 K=2			M(3)									
CO5 K=3					M(3)				M	M	M	

Object Oriented Programming using C++

Code: CS(EE)606B

Contact: 3L

Credits: 3

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:

Herbert Schildt – "Java: The Complete Reference " – 9th Ed. – TMH

E. Balagurusamy – " Programming With Java: A Primer " – 3rd Ed. – TMH.

References:

R.K Das – " Core Java for Beginners " – VIKAS PUBLISHING.

Rambaugh, James Michael, Blaha – " Object Oriented Modelling and Design " – Prentice Hall, India.

Paper Name: Software Engineering

Code: CS(EE) 606D

Contacts: 3L

Credits: 3

Allotted hours: 36L

Prerequisite:

An understanding of basic computer software

Object Oriented programming skills.

Course Objective(s)

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 Outcomes

CS(EE) 606.1	To 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(EE) 606.2	To analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project
CS(EE) 606.3	To design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns.
CS(EE) 606.4	To acquire the ability to function effectively in teams.
CS(EE) 606.5	To develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.
CS(EE) 606.6	To identify 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 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS(EE) 606.1	√	√	√	√	√							
CS(EE) 606.2	√	√	√									
CS(EE) 606.3						√		√		√		
CS(EE) 606.4									√	√		
CS(EE) 606.5									√		√	√
CS(EE) 606.6									√	√	√	√

Paper Name: Control System 2 Lab

Code : EE 691

Contacts : 3P

Credits : 2

Prerequisite: Knowledge of MatLab

Course Outcome

EE691.1: Student will be able to perform experiments on nonlinearity.

EE691.2: Student will be able to take initiative to identify, formulate and analyse problems regarding lead-lag compensation, state variable analysis using simulation tools.

EE691.3: Student will be able to write report on the performed experiment.

EE691.4: Student will be able to perform the experiment effectively as an individual using MATLAB and hardware equipment.

EE691.5: Student will be able to provide meaningful solutions by applying knowledge acquired in non linear control system.

EE691.6: Student will be able to function as a member or leader in team regularly.

Course contents

List of Experiments:

1. STUDY OF A PRACTICAL POSITION CONTROL SYSTEM. Obtaining closed step responses for gain setting corresponding to over-damped and under-damped responses. Determination of rise time and peak time using individualized components in SIMULINK. Determination of un-damped natural frequency and damping ratio from the experimental data.

2. TUNING OF P, PI, AND PID CONTROLLER FOR FIRST ORDER PLANT WITH DEAD TIME USING Z-N METHOD. Process parameters (time constant and delay/lag) will be provided, the students would compute controller gains by using Z-N method. Steady state and transient performance of the closed loop plant with and without steady disturbances will have to be noted.

Theoretical phase and gain margins will have to be manually computed for each gain settings.

3. DESIGN OF LEAD AND LAG COMPENSATION USING CACSAD TOOLS (Plant transfer function will be provided. Step response is to be obtained. (PSPICE, MATLAB, SciLab may be used).

4. STATE VARIABLE ANALYSIS USING CACSAD COMMAND TOOL. Familiarization and use of CACSAD command for state variable analysis. Obtaining transfer function from SV model and vice versa. Obtaining step response for a SISO system given in SV form. (PSPICE, MATLAB, SciLab may be used).

5. STATE VARIABLE ANALYSIS USING CACSAD BLOCK DIAGRAM TOOL. Familiarization and use of CACSAD BLOCK DIAGRAM TOOL for state variable analysis. Obtaining step response and initial condition response for a single input, two output system given in SV form. (PSPICE, MATLAB, SciLab may be used).

6. PERFORMANCE ANALYSIS OF A DISCRETE TIME SYSTEM USING CACSAD TOOL. Familiarization and use of CACSAD block diagram tool for Digital Control System. Study of closed response of a continuous system with a digital controller with sample and hold. (PSPICE, MATLAB, SciLab may be used).

7. STUDYING THE EFFECTS OF NONLINEARITY IN A FEEDBACK CONTROLLED SYSTEM USING TIME RESPONSE. Determination of step response with a limiter nonlinearity introduced into the forward path of 2nd order unity feedback control systems. The open loop plant will have one pole at the origin and the other pole will be in LHP or RHP. To verify that (i) with open loop stable pole, the response is slowed down for larger amplitude input and (ii) for unstable plant , the closed loop system may become oscillatory with large input amplitude. (PSPICE, MATLAB, SciLab may be used).

8. STUDYING THE EFFECTS OF NONLINEARITY IN A FEEDBACK CONTROLLED

SYSTEM USING PHASE PLANE PLOTS. Determination of phase plane trajectory and possibility of limit cycle of common nonlinearities. CACSAD block diagram tool will be used. (PSPICE, MATLAB, SciLab may be used).

Reference Books;

1. Herniter, Programming in MATLAB, Vikas

2. Ogata K : Modern Control Engg. 4e, Pearson/PHI

Note: From the list of experiments a minimum of 7 (seven) experiments shall have to be performed by one student

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EE691.1	3	2	1	1	1	1	-	-	2	-	-	-
EE691.2	-	-	-	-	-	-	-	-	3	-	-	-
EE691.3	-	-	-	-	-	2	3	-	-	-	-	1
EE691.4	-	-	-	-	2	1	-	-	-	-	-	-
EE691.5	2	-	2	-	1	-	-	-	-	-	-	1
EE691.5:	-	-	-	-	-	3	-	3	3	-	2	2

Paper Name: Power System II Lab

Paper Code: EE692

Total Contact hour: 3P

Credit: 2

Pre requisites: Power System I, Machine I, Circuit Theory

Course Objective

1. To design and conduct experiments on various power system components-analyze and interpret data.

2. To give hands on experience in using modern software tools for simulation of various power system controls.

3. Acquiring these knowledge Students are ready to perform to industrial and research power system laboratory.

Course Outcome

Course Outcome On completion of the course students will be able to

EE692.1: Analyze the testing, operation and response of protection of electrical instruments.

EE692.2: Conduct experimental investigation and gain knowledge of various parts of relays and its operation.

EE692.3: Able to incorporate the measuring error with actual value and calibrate the instruments transformer.

EE692.4: Enhance the capability of software analysis by load flow solution in ETAP, Mat Lab etc.

List of Experiments:-

1. Study on (i) on load Time Delay Relay (ii) off load Time Delay Relay
2. Polarity, Ratio and Magnetization Characteristics Test of CT & PT
3. Testing on (i) Under Voltage Relay and (ii) Earth Fault Relay
4. Study on D C Load Flow
5. Study of A C Load Flow Using Gauss – Seidel Method
6. Study of A C Load Flow Using Newton -Raphson Method
7. Study of IEEE 30,66 bus Load Flow by Software Simulation(ETAP ,MAT Lab or others)
8. Study on Economic Load Dispatch by software
9. Study of Transformer Protection by Simulation
10. Study of Generator Protection by Simulation
11. Study of Motor Protection by Micon Relay
12. Study of Different Characteristics of Over Current Relay.

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3				1						
CO2		3	3			1						
CO3				2								
CO4	3		3	2								

3=High,2=Medium,1=Low

Course Name: Power Electronics Laboratory

Course Code: EE693

Course Credit: 2

Contact Hour: 3P

Prerequisite: Concept of Basic Electronics

Course Objective

The objectives of this course are

1. To prepare students to perform the analysis of any power electronics circuit.

2. To study of the characteristics of different power electronics devices and how it's work.

3. Familiar with PSIM Software to study of the operation of different power electronics converter.

4. Using PSIM Software plot different circuit wave response and also find out the average value, peak value and RMS value of different voltages & currents.

Course Outcome

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

693.1: The skill to analyze the response of any power electronics devices.

693.2. The ability to troubleshoot the operation of an power electronics circuit.

693.3. The ability to select suitable power electronic devices for a given application.

693.4. The ability to know how to control and convert output signal as per requirements.

693.5. The ability to construct any power electronics circuits as needed in operation.

Course contents:

List of Experiments:

1. Study of the characteristics of an SCR.
2. Study of the characteristics of a TRIAC
3. Study of different triggering circuits of an SCR.
4. Study of the operation of a single phase full controlled bridge converter with R and R-L load.
5. Study of performance of single phase half controlled symmetrical and asymmetrical bridge converters.
6. Study of performance of step down chopper with R and R-L load.
7. Study of performance of single phase controlled converter with and without source inductance (simulation)
8. Study of performance of step up and step down chopper with MOSFET, IGBT and GTO as switch (simulation).
9. Study of performance of single phase half controlled symmetrical and asymmetrical bridge converter. (Simulation)
10. Study of performance of three phase controlled converter with R & R-L load (simulation)
11. Introduction to PLC and different industrial applications.

Text Books:

1) P.C. Sen, Power Electronics.

2) M.H. Rashid, Power Electronics, PHI/ Pearson Education.

3) P.S. Bhimra, Power Electronics, Khanna Publications.

4) K. Hari Babu: Power Electronics

Reference Books:

1) C.W. Lander, Power Electronics, McGraw Hill.

2) B.K.Bose, Modern Power Electronics, JAICO.

3) Mohan, N Undeland, TM & Robbins, WP- Power Electronics, John Wiley & Sons.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
693.1	H			L								
693.2		L		M								
693.3	M	L		M					L			
693.4	M			M					L			
693.5	M	L		M								

Course Name: Electrical System Design-II

Course Code: EE681

Course Credit: 2

Contact Hour: 3P

Prerequisite: Concept of Stationary and Rotating machines, Magnetic Circuit and coupling, basic knowledge of computer aided drawing.

Course Objective

The objectives of this course are

1. Ability to understand the various parts and performance of Machines.

2. Ability to design and estimate for a particular machine.

3. Ability to design magnetic circuit of machines and performance and characteristics study.

Course Outcome

On completion of the course students will be able to

ESD 681.1: Gain knowledge of designing a system.

ESD 681.2: Synchronize different machines in a system.

ESD 681.3: Use of theoretical designing concept to implement a practical model.

ESD 681.4: Estimate and planning system.

Course contents

List of Experiments:

1. Designing the power distribution system for a small township.

2. Designing a double circuit transmission line for a given voltage level and power (MVA) transfer.

3. Designing a three phase squirrel cage induction motor.

4. Designing a permanent magnet fractional hp servo motor

5. Project module using computer aided machine design.

Text Books:

Electrical Systems Design, M. K. Giridharan, I. K. International Publishing House Pvt. Ltd.

Electrical Systems Designing Made Simple, Rajiv Shankar, Viva Books Private Limited.

Electrical Power System Design, M.V. Deshpande, Mcgraw Higher Ed

Reference Book:

Electrical Design Estimating and Costing, K. B. Raina, New Age International Ltd.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
ESD 681.1	H		H		L						L	
ESD 681.2		M			L							M
ESD 681.3		H	L								L	
ESD 681.4	M		M									L

Proposed Syllabus (LAB)

Introduction to JAVA Lab

Code: CS(EE)696A

Contact: 3P

Credits: 2

Practical Class allotted: 12 no of labs X 3=36

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.

7. Assignments on applet programming.

Name of the Paper: Software Engineering Lab

Paper Code: CS(EE)696D

Contact (Periods/Week): 3L

Credit Point: 2

Prerequisite:

For Software Engineering Lab, design a project proposal which will be used throughout the lab for performing different experiments using CASE Tools.

Course Objective(s)

To learn software development skill through various stages of software life cycle. .

To ensure the quality of software through software development with various protocol based environment.

Course Outcomes

CS(EE)696D.1 To handle software development models through rational method.

CS(EE)696D.2 To prepare SRS document, design document, test cases and software configuration management and risk management related document.

CS(EE)696D.3 To Develop function oriented and object oriented software design using tools like rational rose.

CS(EE)696D.4 To perform unit testing and integration testing

CS(EE)696D.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

Recommended books:

Software Engineering : A practitioner's approach– Pressman(TMH)

Software Engineering- Pankaj Jalote (Wiley-India)

CO-PO Mapping

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS(EE)696D.1	√	√	√	√	√							√
CS(EE)696D.2	√	√	√									√
CS(EE)696D.3	√	√	√	√	√							
CS(EE)696D.4	√	√										
CS(EE)696D.5	√	√										√

4th Year, 7th SEMESTER

Sl. No.		Code	Paper	Contact Periods Per Weeks				Total Contact Hours	Credit
				L	T	P	S		
1	PC	EE 701	Electric Drives	3	0	-	-	3	3
2	PE	EE 702	Elective III a. Utilization of Electric Power b. Advanced Power Electronics c. Illumination Engineering	3	1	0	-	4	4
3	PE	EE703	Elective-IV a. Advanced Power Systems b. Power generation and economics c. High Voltage engineering d. Advanced Electrical Measurement & Instrumentation	3	1	0	-	4	4
4	OE	CS(EE)705	Elective V a. Artificial intelligence and soft	3	0	-	-	3	3

			computing b. Digital image processing c. Computer Networking d. Data Base Management System						
5	HS	HU 702	Values and ethics in Profession	2	0			2	2
PRACTICAL:									
1	PC	EE791	Electric Drives lab	0	0	3	0	3	2
2	OE	EE795	Elective V lab	0	0	2	0	2	1
3	PW	EE781	Assigned Project -I	0	0	6	0	6	4
4	PW	EE771	Seminar on Industrial Training and Report	0	0	0	0	0	1
5	PW	MC781	Entrepreneurship Development	0	0	0	0	2	0 (2 units)

	Total Theory	16	16
	Total Practical	13	08
	TOTAL	29	24

Paper Name: ELECTRIC DRIVES

Paper Code: EE701

Total Contact Hours: 30

Credit: 3

Pre requisites:

Concept of Electrical Machines and Power Electronics.

Course Objective:

1. Provide knowledge to select electrical machines for particular drive requirement.
2. Study the characteristics and the operation of electrical machines for specific requirement.

Course Outcomes:

EE701.1. Student will be able to select electric motors for a particular drive based on their characteristics.

EE701.2. Student will be able to accrue the knowledge of speed-control of DC motors and Induction motors.

EE701.3. Student will be able to accrue the knowledge of power electronic converters used for DC motor and Induction motor speed control.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE701.1	L											
EE701.2	L	H	M		L				L			L
EE701.3	L	H	M		L				L			L

Course contents:

Module – I: Electric Drive (4L)

Concept, classification, parts and advantages of electrical dives, Types of Loads, Fundamental torque equations, Equivalent value of drive parameters for loads with rotational and translational motion. 2L

Determination of moment of inertia, Steady state stability, Transient stability. Multiquadrant operation of drives. 2L

Module – II: Motor Power Rating (3L)

Thermal model of motor for heating and cooling, classes of motor duty, determination of motor rating for continuous, short time and intermittent duty, equivalent current, torque and power methods of determination of rating for fluctuating and intermittent loads. 3L

Module – III: Starting of Electric Drives (2L)

Effect of starting on Power supply, motor and load. Methods of starting of electric motors. Acceleration time Energy relation during stating, methods to reduce the Energy loss during starting. 2L

Module – IV: DC Motor Drives (11L)

Review of fundamental equations of DC machines, torque-speed characteristics of separately excited DC motor, conventional method of speed control – armature voltage control and field flux control. 1L

Single phase and three phases fully controlled and half controlled DC drives, Dual converter control of DC drives. Power factor, supply harmonics and ripple in motor current. 3L

Chopper fed DC motor for speed control, armature current waveform and ripple, calculation of losses in DC motor and chopper, efficiency of DC drive. 2L

Motoring and generating modes operation of a separately excited dc machine, four quadrant operation of DC machine; single-quadrant, two-quadrant and four-quadrant choppers; steady-state operation of multi-quadrant chopper fed DC drive, regenerative braking. 2L

Control structure of DC drive, inner current loop and outer speed loop, dynamic model of DC motor – dynamic equations and transfer functions, plant transfer function, current controller specification and design, speed controller specification and design. 3L

Module – V: Induction Motor Drives (7L)

Review of induction motor equivalent circuit and torque-speed characteristic, variation of torque speed curve with (i) applied voltage, (ii) applied frequency and (iii) applied voltage and frequency, constant flux operation, flux weakening operation. 2L

Review of three-phase voltage source inverter, generation of three-phase PWM signals, sinusoidal modulation, space vector theory, conventional space vector modulation; constant V/f control of induction motor, steady-state performance analysis based on equivalent circuit. 3L

Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, slip power recovery. 3L

Module – V: Industrial Applications (2L)

Drive consideration for Textile mills, Steel rolling mills, Cement mills, Paper mills, Machine tools. Cranes & hoist drives. 2L

Text Books:

1. G.K. Dubey, "Fundamental of Electrical Drives", New Age International Publication.
2. Vedam Subrahmanyam, "Electric Drives", TMH
3. S.K. Pillai, "A first course on Electrical Drives", New Age International Publication.

Reference Books:

1. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", Prentice Hall, 2001.
2. B.K. Bose, "Modern Power Electronics & AC Drives", Pearson Education.
3. Austin Hughes, "Electric Motor & Drives", Newnes.
4. G. K. Dubey, "Power Semiconductor Controlled Drives", Prentice Hall, 1989.
5. W. Leonhard, "Control of Electric Drives", Springer Science & Business Media, 2001.

Sub Code : EE 702A

Sub Name : Utilization of Electric Power

Code:- EE 702A

Branch : EE

Semester : 7th

Detail Syllabus:

Module 1: 16L

Electric Traction

Requirement of an ideal traction system, Supply system for electric traction, Train movement (speed time curve, simplified speed time curve, average speed and schedule speed), Mechanism of train movement (energy consumption, tractive effort during acceleration, tractive effort on a gradient, tractive effort for resistance, power & energy output for the driving axles, factors affecting specific energy consumption, coefficient of adhesion).

Electric traction motor & their control:

Parallel and series operation of Series and Shunt motor with equal and unequal wheeldiameter, effect of sudden change of in supply voltage, Temporary interruption of supply, Tractive effort and horse power. Use of AC series motor and Induction motor for traction.

Traction motor control:

DC series motor control, Multiple unit control, Braking of electric motors, Electrolysis by current through earth, current collection in traction system, Power electronic controllers in traction system.

Module 2: 08L

Illumination

The nature of radiation, Polar curve, Law of illumination, Photometry (Photovoltaic cell, distribution photometry, integrating sphere, brightness measurement),

Types of Lamps:

Conventional and energy efficient, Basic principle of light control, Different lighting scheme & their design methods, Flood and Street lighting.

Module 3: 06L

Electric Heating welding

Types of heating, Resistance heating, Induction heating, Arc furnace, Dielectric heating, Microwave heating.

Module 4: 06L

Electrolytic processes

Basic principles, Faraday’s law of Electrolysis, Electro deposition, Extraction and refining of

Metals, Power supply of Electrolytic processes.

Reference Books:

Generation Distribution and Utilization of Electrical Energy, C.L. Wadhawa, New Age International Publishers.

Art and Science of Utilization of Electrical Energy, H. Partab, Dhanpat Rai & Sons.

Utilisation of Electric Energy, E.Openahaw Taylor, Orient Longman.

Course Outcomes (COs):

Ability to formulate and then analyze the working of traction motor & their control using mathematical model under loaded and unloaded conditions.

Ability to understand and explain the principle of operation and performance of traction motor.

Skill to analyze the response of d.c. motor, induction motor and transformer.

Ability to troubleshoot the operation of d.c. motor, induction motor and transformer.

Ability to analyze the working of Electric Heating, welding processes.

Ability to calculate illumination level for a given application and then select the suitable specification for installation.

Mapping of COs to POs

Course	COs	Programme Outcomes											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	1	H											
	2	H	M	L									
	3			M	H								
	4			M									

	5			H	H								
	6			M	H								

T

Paper Name: Advanced Power Electronics

Paper Code: EE702B

Total Contact hours : 36

Credits : 3

Prerequisite : Knowledge in Power Electronics.

Course Objective : After successful completion of this course, the students will be able to understand the concept of different converters, multilevel inverters and compensators.

CO1: Describe the basic concepts of resonant converters, matrix converter and multilevel inverter

CO2: Describe the basic concepts of matrix converter and multilevel inverter

CO3: Apply the knowledge of contemporary technical issues in Power electronics field and Compensators currently used in modern industries.

CO-PO MAPPING (3: strong 2:medium 1:low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2			1	2								
CO3				3		2	1					

Course Contents

Module 1

Advanced Switch Mode Power Converters: Cuk dc-dc converter, Full bridge dc-dc converter, Half-bridge converter, Forward converter, Flyback converter, Push-pull converter, voltage & current mode control of DC-DC converter, SEPIC converter, different protection schemes.

11L

Module 2

Resonant Converters: Introduction, classification of resonant converters, series and parallel resonant inverters, load resonant converters, resonant switch converters, zero voltage and zero current switching resonant converters. 9L

Module 3

Multilevel Inverters: Concept, types of multilevel inverters, diode-clamped, flying-capacitor, and cascaded multilevel inverters, SPWM techniques of multilevel inverter, applications, comparison. 7L

Module 4

FACTS: Principles of shunt and series compensation. 3L

Module 5

compensators: TCR, TCS, SVC, TSSC, TCSC, UFC, comparison, Matrix converters: Basic principles and analysis, applications. 6L

Texts/References Books:

M. H. Rashid, “Power Electronics: Circuits, Device and Applications”, 2nd Ed. 1993, Prentice-Hall, Inc.

N. Mohan, T. M. Undeland, and W. P. Robbins, “Power Electronics: Converters, Application and Design”, 3rd. Ed., John Wiley, 2003

A. M. Trzynadlowski, “Introduction to Modern Power Electronics” John Wiley, 1998.

Paper Name: Advance Power System

Paper Code: EE703A

Total Contact Hours: 40

Credit: 3

Prerequisite: Electrical Machines (EE501), Power System I (EE 502), Power System II (EE 602), Control System I (EE503), Control System II (EE 603).

Course Objective: The purpose of this course is to provide advance industry oriented knowledge of power system.

Course outcome:

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

EE 703A.1: Acquire in-depth advance knowledge in the domain of modern and industrial oriental power systems.

EE 703A.2: Ability to critically analyze various power systems components, models and their operation, optimization of cost criteria.

EE 703A.3: Ability to apply fundamentals and concepts to analyze, formulate and solve complex problems of electrical power systems and its components and control of frequency and voltages.

EE 703A.4: Ability to use advanced techniques, skills and modern scientific and engineering tools for professional practice for power system to enhanced power quality, Stability,reliability, security and load ability.

Course contents:

MODULE I [6L]

Objectives of Power System Operation

Power Systems in Restructured Environment; Distributed and Dispersed Generation; Environment Aspects of Electric

Power Generation.

MODULE II [10L]

Economic Operation of Energy Generation Systems 10

Generation Cost Curves; Economic Operation of Thermal System; Plant Scheduling; Transmission Loss and Penalty

Factor; Hydro-Thermal Scheduling; Concept of Reserves and Constraints; Unit Commitment

MODULE III [8L]

Automatic Generation Control

Concept of AVR and ALFC Loops, Significance of Double Loop in ALFC; Exciter and VAR Control; Single Area

Load Frequency Control; Two Area Load Frequency Control; Frequency Response.

MODULE IV [8L]

Compensation in Power System

Reactive Power Sensitivity and Voltage Control; Load Compensation with Capacitor Banks; Line Compensation withReactors; Shunt and Series Compensation; Fixed Series Capacitors; Thyristor Controlled Series Capacitors(TCSC); Introduction to SVC and STATCOM,UPFC.

MODULE V [8L]

Power System Transients

Types of System Transients; Overvoltage in Transmission Lines; Propagation of Surges and Travelling Waves;Protection against Lightning and Surges;

Text Books

1. Power System Engineering, Kothari & Nagrath, Mc Graw Hill

2. Power System Analysis, Granger and Stevension, Mc Graw Hill

3. Electric Power Genration operation and control, Wood and Woolenberg, Willey.

Reference Books:

1. Power system stability and Control, P. Kundur , Mc Graw Hill

2. Modern power system analysis, Kothari & Nagrath, Mc.Graw Hill

3. Power system Analysis, Nagsarkar & Sukhija, Pearson

4. Power system analysis, operation and control, Chakrabarti and Halder, PHI

5. Power system analysis -Book of Elgard.

CO-PO mapping:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
EE 703A.1	3	1	-	-	-	-	2	-	2	-	2	1
EE 703A.2	3	3	2	-	2	-	-	1	1	-	1	1
EE 703A.3	3	2	3	2	-	-	-	-	2	-	-	1
EE 703A.4	3	2	3	3	-	-	-	-	2	-	1	1

1=L 2=M 3=H

Paper Name: Power Generation and Economics

Paper Code: EE 703B

Total Contact Hours: 40

Credit: 3

Pre requisites:

Concepts of basic electrical engineering, circuit theory and electrical machine.

Course Objective:

The objectives of this course are

To introduce students to different aspects of power generation. • To understand the electrical power plant operation and control with respect to its economic aspect

To familiarize the students to the working of power plants based on different fuels.

To expose the students to the principles of safety and environmental issues.

To inculcate research attitude and lifelong learning among graduates.

Course Outcomes:

At the end of the course, a student will be able to:

1. Describe and analyze different types of sources and mathematical expressions related to with power generation and economics.

2. Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types.

3. Discuss the working principle and basic components of the steam power plants, hydro electric plants, nuclear power plant and the economic principles and safety precautions involved with it.

4. Discuss and analyze the mathematical and working principles of different electrical equipments involved in the generation of power

5. Solve the problems related to the economic dispatch of power, plant scheduling, unit commitment and formulate strategies to minimize transmission line losses and penalties imbibed & analyze various power systems components, models and their operation, optimization of cost criteria

6. Use advanced techniques, skills and modern scientific and engineering tools for professional practice for power system to enhanced power quality, reliability, security and load ability.

Course contents:

MODULE I [7L]

Economics of Generation :

Introduction: Energy sources and their availability, Principle types of power plants, their special features and applications, Present status and future trends.

Cost of power generation- Thermal, Hydro and Nuclear. Types of Consumers in a distribution system-Domestic, Commercial, Industrial etc. Concept of load factor, plant capacity factor, plant use factor, diversity factor, demand factor. Choice of size and number of generation units.

MODULE II [8L]

Tariff-:

Block rate, flat rate, two part, maximum demand, Power factor and three part tariffs. Subsidization and Cross subsidization. Availability tariff of generation companies. Pool tariff of transmission companies. Availability based tariff (ABT).

MODULE III [7L]

Unit Commitment:

Constraints in Unit Commitment, Spinning reserve, Thermal unit constraints, Hydro constraints, Must run, Fuel constraints. Unit commitment solution methods,

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	2	2	2	3	3	1	1	-	-	2	-	1

MODULE IV [10L]

Economic Dispatch:

Transmission loss formulae and its application in economic load scheduling.

Computational methods in economic load scheduling. Active and reactive power optimization.

MODULE V [8L]

State Estimation and load forecasting in power system:

Introduction, state estimation methods, concept of load forecasting, load forecasting technique and application in power system.

Text Books:

1. Economic operation of Power System, L.K. Kirchmayar John Wiely, Newyork.

2. Power system Analysis, operation & control, Chakrabarty & Haldar, 2nd edition, PHI.

3. Modern power system analysis, D.P. Kothari & I.J. Nagtrath, Tata McGraw Hill.

Reference Books:

1. Power generation operation & control, A.J. Wood & B.F. Wollenberg, Wiley India.

2. Operation and control in power system, P.S.R. Murthy, BSP Publication.

3. A Course in Power Systems J.B. Gupta Katson

CO-PO Mapping:

2	3	3	3	3	2	-	-	-	-	1	2	2
3	3	2	1	2	-	1	-	1	1	2	1	1
4	3	1	3	1	2	-	1	-	-	1	1	1
5	3	1	3	2	-	-	2	2	1	1	1	2
6	3	3	2	2	-	-	2	1	-	1	1	1

Name of the Paper: COMPUTER NETWORKING

Paper Code: CS(EE)705C

Contact (Periods/Week):=3L/Week

Credit Point: 3

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(s)

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(s)

CO1: Understand OSI and TCP/IP models.

CO2: Analyze MAC layer protocols and LAN technologies.

CO3: Design applications using internet protocols.

CO4: Implement routing and congestion control algorithms.

CO5: 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]

Module IV: 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 V: Application Layer [4L]

Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW: Cryptography (Public, Private Key based), Digital Signature, Firewalls

Module VI: Socket Programming [2L]

Introduction to Socket Programming, UDP socket and TCP Socket

Text books:

B. A. Forouzan – “Data Communications and Networking (3rd Ed.) “ – TMH

S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI

W. Stallings – “Data and Computer Communications (5th Ed.)” – PHI/ Pearson Education

4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

Recommended books:

Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education

Leon, Garica, Widjaja – "Communication Networks" – TMH

Walrand – "Communication Networks" – TMH.

Comer – "Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)" – Pearson Education/PHI

Substantial/ High	3
Medium	2
Low	1
No Correlation	

CO-PO Mapping

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS(EE)705C.1		2		2					2			
CS(EE)705C.2		2							2			
CS(EE)705C.3	2	2			2				2			
CS(EE)705C.4	2	2			2	2			2			
CS(EE)705C.5	3	3			3				2			
CS(EE)705C												

DATABASE MANAGEMENT SYSTEM
CS(EE)705D
Contact: 3L

Credits: 3

Prerequisite:
1. Logic of programming language
2. Basic concepts of data structure and algorithms

Course Objectives
1. To learn the data models, conceptualize and depict a database system
2. To design system using E-R diagram.
3. To learn SQL & relational database design.
4. To understand the internal storage structures using different file and indexing techniques.
5. To know the concepts of transaction processing, concurrency control techniques and recovery procedure**.**

Course Outcomes(COs)

On completion of the course students will be able to
1. Apply the knowledge of Entity Relationship (E-R) diagram for an application.
2. Create a normalized relational database model
3. Analyze real world queries to generate reports from it.
4. Determine whether the transaction satisfies the ACID properties.
5. Create and maintain the database of an organization.

Module 1:
Introduction [3L]

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Module 2:
Entity-Relationship and Relational Database Model [11L]

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features, case study on E-R Model. Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

Module 3:
SQL and Integrity Constraints [6L]

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested

Subqueries, Database security application development using SQL, Stored procedures and triggers.

Module 4:
Relational Database Design [8L]
Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF , Case Study

Module 5:
Internals of RDBMS [9L]
Physical data structures, Query optimization: join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock base protocols; two phase locking, Dead Lock handling

Module 6:
File Organization & Index Structures [6L]
File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes

Text Books:
1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, “Fundamentals of Database Systems”, Benjamin Cummings
Publishing. Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, “Transaction Processing : Concepts and Techniques”, Moragan Kauffman Publishers.
5. Ullman JD., “Principles of Database Systems”, Galgottia Publication.

Reference:
1. Jain: Advanced Database Management System CyberTech
2. Date C. J., “Introduction to Database Management”, Vol. I, II, III, Addison Wesley.
3. “Fundamentals of Database Systems”, Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
4. “Database Management Systems”, Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

CO-PO MAPPING

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS(EE)705D.1	2	2	2	2	3	2	1	1	2	2	3	3	2	2	1
CS(EE)705D.2	2	3	3	3	3	1	1	1	2	2	3	3	2	2	2
CS(EE)705D.3	3	3	2	3	3	2	2	2	3	3	3	3	3	2	2
CS(EE)705D.4	3	3	2	2	2	1	1	1	1	1	2	3	2	1	1
CS(EE)705D.5	3	3	3	3	3	2	2	2	3	3	3	3	3	2	2
CS(EE)705D(average)	3	3	2	3	3	2	1	1	2	2	3	3	2	2	2

3=HIGH, 2= MEDIUM, 1=LOW

Paper Name: VALUE AND ETHICS IN PROFESSION

Paper Code: HU 702

Total Contact Hours: 24

Credit: 2

Pre requisites:

Course Objective: To create awareness on professional ethics and Human Values

Course Outcome: On Completion of this course student will be able to

Co.1	Understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.
Co.2	understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
Co.3	understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field
Co.4	Aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
Co.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

Course contents:

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 mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
Co-1	–	–	–	–	–	1	1	1	1	2	–	–
Co-2	–	–	–	–	–	1	1	3	1	2	–	–
Co-3	–	–	–	–	–	3	2	3	–	1	–	–
Co-4	–	–	–	–	–	3	2	1	–	–	–	–
Co-5	–	–	–	–	–	3	2	2	–	1	3	–

Paper Name: ELECTRIC DRIVES LAB

Paper Code: EE791

Total Contact Hours: 30

Credit: 3

Pre requisites:

Concept of Electrical Machines and Power Electronics.

Course Objective:

1. Provide knowledge to operate electrical machines for a specific drive.
2. Study the speed control techniques of electrical machines for particular drive requirement.

Course Outcomes:

Applying	EE791.1	Student will be able to apply power electronic converters for motor speed control
Analyzing	EE791.2	Student will be able to analyze the characteristics of electric motors for different type of loads.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE701.1		L		H	H	M						L
EE701.2		L		H	H	M						L

Course contents:

1. Study of thysistor controlled DC Drive.
2. Study of Chopper fed DC Drive
3. Study of AC Single phase motor-speed control using TRIAC.
4. PWM Inverter fed 3 phase Induction Motor control using PSPICE / MATLAB / PSIM Software.
5. VSI fed Induction motor Drive analysis using MATLAB/DSPICE/PSIM Software.
6. CSI fed Induction motor Drive analysis using MATLAB/DSPICE/PSIM Software.
6. Study of V/f control operation of 3F induction motor drive.
7. Study of permanent magnet synchronous motor drive fed by PWM Inverter using Software.
8. Regenerative / Dynamic braking operation for DC Motor - Study using software.
9. Regenerative / Dynamic braking operation of AC motor - study using software.
10. PC/PLC based AC/DC motor control operation.

Name of the Paper: COMPUTER NETWORKING Lab

Paper Code: EE795C

Contact (Periods/Week):=3L/Week

Credit Point: 2

No. of Lectures: 36

Prerequisite:

Familiarity and knowledge of Computer Network and Computer Architecture

Also require strong knowledge of programming languages like C, Java and UNIX or Linux environment.

Course Objectives:

To provide students with an overview of the concepts and fundamentals of data communication and computer networks

To familiarize with the basic taxonomy and terminology of computer networking area. 3

To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite

Course Outcome(s)

CO1: Demonstrate the socket program using TCP & UDP.

CO2: Develop simple applications using TCP & UDP.

CO3: Develop the code for Data link layer protocol simulation.

CO4: Examine the performances of Routing protocol.

CO5: Experiment with congestion control algorithm using network simulator

Syllabus

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]

Implementation of flow control mechanisms [3L]

Socket Programming using TCP and UDP [15L]

Implementing routing protocols such as RIP, OSPF. [2L]

Familiarization of advanced simulators like Packet Tracer, NS2/NS3, OMNET++, TinyOS[4L]

Server Configuration: only web server (If time permit..instructor can do more than that) [6L]

Text books:

TCP sockets in C programs-Practical guide for Programmers By Micheal J Donahoo and Kenneth L calvert.

Socket Programming by rajkumar Buyaa.

Substantial/ High	3
Medium	2
Low	1
No Correlation	

CO-PO Mapping

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE795C.1	3	3	3	2	3	2	1		3	2	2	3
EE795C.2	3	3	3	2	3	3	2	3	3	2	2	3
EE795C.3	3	3	3	2	2	1	2	1	3	2	2	3
EE795C.4	3	3	3	1	2	2	1	3	3	2	2	3
EE795C.5	3	3	3	2	2	2	1	2	3	2	2	3
EE795C	3	3	3	2	3	2	1	1	3	2	2	3

DATABASE MANAGEMENT SYSTEM LAB
CS(EE)795D
Contact: 3P
Credits: 2

Prerequisite:

1. Logic of programming language
2. Basic concepts of data structure and algorithms

Course Objectives

1. To learn the data models, conceptualize and depict a database system
2. To learn the fundamental concepts of SQL queries.
3. To understand the concept of designing a database with the necessary attributes.
4. To know the methodology of Accessing, Modifying and Updating data & information from the relational databases
5. To learn database design as well as to design user interface and how to connect with database.

Course Outcome(s)

On completion of the course students will be able to

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.
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.
3. Differentiate between DBMS and advanced DBMS and use of advanced database concepts and become proficient in creating database queries.
4. Analyze database system concepts and apply normalization to the database.
5. Apply and create different transaction processing and concurrency control applications.

- Structured Query Language

1. Creating Database
   Creating a Database
   Creating a Table Specifying Relational Data Types
   Specifying Constraints Creating Indexes
2. Table and Record Handling
   INSERT statement
   Using SELECT and INSERT together
   DELETE, UPDATE, TRUNCATE statements
   DROP, ALTER statements
3. 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
4. Database Management
   Creating Views
   Creating Column Aliases

Creating Database Users
Using GRANT and REVOKE

- PL/SQL
- Database design using E-R model and Normalization
- Design and implementation of some on line system [Library Management System]

Text Book:

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 Mapping

CO #	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CS(EE)795D.1	2	2	2	2	3	2	1	1	2	2	3	3	2	2	1
CS(EE)795D.2	2	3	3	3	3	1	1	1	2	2	3	3	2	2	2
CS(EE)795D.3	3	3	2	3	3	2	2	2	3	3	3	3	3	2	2
CS(EE)795D.4	3	3	2	2	2	1	1	1	1	1	2	3	2	1	3
CS(EE)795D.5	3	3	3	3	3	2	2	2	3	3	3	3	3	2	2
CS(EE)795D (average)	3	3	2	3	3	2	1	1	2	2	3	3	2	2	2

3=HIGH, 2= MEDIUM, 1=LOW

4th Year, 8th SEMESTER

Sl. No.		Code	Paper	Contact Periods Per Weeks				Total Contact Hours	Credit
				L	T	P	S		
1	HS	HU805	Industrial & Financial Management	2	0	0	0	2	2
2	PE	EE 801	Elective VI a. HVDC Transmission b. Energy Management and Audit c. Power Plant Engineering	3	1	0	0	4	4
3	PE	EE 802	Elective VII a. Sensors & Transducers	3	0	0	0	3	3
			b. Process control and instrumentation						
			c. Electronic & Instrumentation Control.						
4	PW	EE881	Project & Thesis	0	0	12	0	12	6

5	PW	EE871	Grand Viva	0	0	0	0	0	3
	TOTAL							21	18

Course Name: HVDC TRANSMISSION

Course Code: EE-801A

Course Credit: 3

Contact Hour: 3L

Prerequisite: Concept of Power System & Power Electronics.

Course Objective

The objectives of this course are

Ability to understand the concept of HVDC Transmission system.

Ability to familiarize the students with the HVDC converters and their control system.

Ability to expose the students to the harmonics and faults occur in the system and their prevention.

Ability to understand Multiterminal HVDC and FACTS Devices.

Course Outcome

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

CO1: Acquire knowledge of HVDC transmission and HVDC converters and the applicability and advantage of HVDC transmission over conventional AC transmission.

CO2: Formulate and solve mathematical problems related to rectifier and inverter control

methods and learn about different control schemes as well as starting and stopping of DC links.

CO3: Analyze the different harmonics generated by the converters and their variation with the change in firing angles.

CO4: Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.

CO5: Understand the existing HVDC systems along with MTDC systems and modern transmission system.

Course contents:

MODULE I [4L]

Introduction: Introduction of DC power transmission technology, comparison of AC and DC transmission, limitation of HVDC transmission, reliability of HVDC systems, application of DC transmission, description of DC transmission system, planning for HVDC transmission, modern trends in DC transmission.

MODULE II [6L]

Analysis of HDVC converters: Choice of converter configuration, simplified analysis of Graetz circuit, converter bridge characteristics, Characteristics of a twelve pulse converter, detailed analysis of converters.

MODULE III [8L]

Control of HVDC converter and systems: Necessity of control of a DC link, rectifier control, compounding of rectifiers, power reversal of DC link, voltage dependent current order limit(VDCOL) characteristics of the converter, inverter extinction angle control, pulse phase control, starting and stopping of DC link, constant power control, control scheme of HVDC converters.

MODULE IV [10L]

Harmonics and filters: Generation of harmonics by converters, characteristics of harmonics on DC side, characteristics of current harmonics, characteristic variation of harmonic currents with variation of firing angle and overlap angle, effect of control mode on harmonics, non characteristic harmonic. Harmonic model and equivalent circuit, use of filter, filter configuration, design of band-pass and high pass filter, protection of filters, DC filters, power line communication and RI noise, filters with voltage source converter HDVC schemes.

MODULE V [4L]

Fault and protection schemes in HVDC systems: Nature and types of faults, faults on AC side of the converter stations, converter faults, fault on DC side of the systems, protection against over currents and over voltages, protection of filter units.

MODULE VI [8L]

Multiterminal HVDC systems: Types of multiterminal (MTDC) systems, parallel operation aspect of MTDC Series and shunt devices and principle of operation and control, UPFC and IPFC, modeling of FACTS devices for power system studies.

Text Books:

1. HVDC Transmission, S. Kamakshaiah& V. Kamaraju, Tata McGraw hill education

2. HVDC Power transmission system, K.R.Padiyar, Wiley Eastern Limited

3. High Voltage Direct Current Transmission, J. Arrillaga, Peter Pregrinu

Reference Books:

4. Power System Stability and Control by PrabhaKundur, McGraw hill

5. Power System Analysis: Operation and Control, AbhijitChakrabarti and SunitaHalder, PHI Learning Pvt. Ltd.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12

CO												
CO.1	M	M										
CO.2	M	H	L									
CO.3			M		L							
CO.4			L	M								
CO.5	M			M	L							

Paper Name: Energy management & audit

Paper Code: EE801B

Total Contact Hours: 40

Credit: 3

Pre requisites:

Power System I .Power System II, Control System I ,Control System II

Course Objective:

The objectives of this course are

1. Ability to Identify the energy management skills and strategies in the energy management system.

2. Ability to understand various energy conservation methods useful in a particular industry.

3. Ability to Select appropriate energy conservation method for the critical area identified.

4. Ability to prepare a energy audit report.

Course Outcome :

On completion of the course students will be able to

1. Identify the demand supply gap of energy in Indian scenario

2. Carry out energy audit of an industry/Organization.

3. Draw the energy flow diagram of an industry and identify the energy wasted or a waste stream.

4. Select appropriate energy conservation method to reduce the wastage of energy.

5. Evaluate the techno economic feasibility of the energy conservation technique adopted.

Course contents:

Module 1(5L)

Energy Management & Audit:

Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach- understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments and intervals of EA regulation. General Principles of Energy Management. Energy Management Skills, Energy Management Strategy. Economics of implementation of energy optimization projects, it’s constraints, barriers and limitations, Financial Analysis: Simple Payback, IRR, NPV, Discounted Cashflow. Case studies of implemented energy cost optimization projects in electrical utilities as well as thermal utilities

Module 2(5L)

Energy Scenario:

Commercial and Non-Commercial Energy, Primary Energy Resources, Commercial Energy Production, Final Energy Consumption, Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Pricing, Energy Sector Reforms, Concept of smart grid, Tariff.

Module 3(5L)

Energy Conservation Act-2001 and related policies:

Energy Conservation Act-2001 and its features, Notification Under the act, Designated agencies, Schemes of Bureau of Energy Efficiency(BEE)-ECBC, S & L, DSM, BLY, SME’s, Designated Consumers, Electricity Act 2003, Integrated Energy Policy

Module 4(6L)

Energy Efficiency and Climate changes:

Energy and environment, Air pollution, Climate change, United Nations Framework Convention on climate change (UNFCCC), Kyoto Protocol, Clean Development Mechanism (CDM), CDM methodology and Procedures, Sustainable development.

Module 5 (5L)

Non-Conventional Energy Sources:

Concept of renewable Energy and importance, Different types of renewable Energy, Solar energy, Wind energy, Biomass energy, Hydro-energy, Fuel cells, Energy from wastes, Wave, Tidal and geothermal. Concept of energy storing device.

Module 6 (6L)

Energy Efficient Technologies in Electrical Systems:

Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, Soft starters with energy saver, Variable speed drives, Energy efficient transformers, Electronic ballast, Occupancy sensors, Energy efficient lighting controls, Energy saving potential of each technology

Module 7(8L)

Electrical Distribution and Utilization:

Electrical Systems, Transformers loss reductions, parallel operations, T & D losses, P.F. improvements, Demand Side management (DSM), Load Management, Harmonics & its improvements, Energy efficient motors and Soft starters, Automatic power factor Controllers, Variable speed drivers, Electronic Lighting ballasts for Lighting, LED Lighting, Trends and Approaches. Study of 4 to 6 cases of Electrical Energy audit and management (Power factor improvement, Electric motors, Fans and blowers, Cooling Towers, Industrial/Commercial Lighting system, etc.)

CO-PO Mapping:

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

Paper Name:Sensors and Transducers

Paper Code: EE802A

Contact (periods/week): 3L

Credit point: 3

Total number of lectures: 32

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 temperature transducers.

To know the overview of miscellaneous sensors.

Course Outcome:

EE802A.1: Students should be able to illustrate the fundamental principles of various types of sensors.

EE802A.2: Students should be able to compare the different types of transducers available.

EE802A.3: Students should be familiar with criteria to recommend appropriate sensors to perform engineering tasks and scientific researches.

EE802A.4: Students will be able to understand the design of different Sensors.

Module I:

Introduction to Sensors and Transducers

Introduction to sensors and transducers, Measurement system, Principles of sensing & transduction, Classification of sensors

Resistive Sensing Element

Potentiometer: Loading effect, Strain gauge: theory, types, temperature compensation, and applications: force, velocity and torque measurements.

Inductive Sensing Element

Self-inductive transducer, Mutual inductive transducers, Variable Reluctance type, Linear Variable Differential Transformer (LVDT): construction, Characteristic Curve, application: LVDT Accelerometer, LVDT displacement sensors

12L

Module II:

Capacitive Sensing Element

Capacitive transducer: Variable Area Type, Variable distance type , Variable Permittivity type, calculation of sensitivities, applications.

Piezoelectric & Piezoresistive Sensing Element

Piezoelectric effects, charge and voltage coefficients, crystal model, materials, natural and synthetic types – their comparison, force and stress sensing, piezoelectric accelerometer, piezoresistive sensor.

Temperature Sensing Element

Material expansion type: solid, liquid, gas and vapour Resistance change type: RTD, materials, construction, tip sensitive and stem sensitive type, Thermister materials, shapes, ranges, accuracy specifications. Thermocouple: types, thermoelectric powers, general consideration, Thermopile.

12L

Module III:

Magnetic Sensors

Sensors based on Villari effect for assessment of force, torque, rpm meters,Hall effect and Hall drive, performance characteristics

Miscellaneous Sensors

Optical sensors: Light Dependent Resistor, Optocoupler, solar cell, Geiger counters, Scintillation detectors, Tachometers: Stroboscopes, Encoders, seismic accelerometer, Measurement of vibration, Proximity switches, Load cell, Introduction to Smart sensors and Sensor network.

8L

TEXT BOOKS-

Patranabis. D, “Sensors and Transducers”, Prentice Hall of India, 1999.

John Brignell,”Intelligent Sensor Systems”, CRC Press; 2nd Revised edition edition,1996

REFERENCES-

Doebelin. E.A, “Measurement Systems – Applications and Design”, Tata McGraw Hill, New York, 2000.

John. P, Bentley, “Principles of Measurement Systems”, III Edition, Pearson Education, 2000.

Murthy.D.V.S, “Transducers and Instrumentation”, Prentice Hall of India, 2001.

Sawhney. A.K, “A Course in Electrical and Electronics Measurements and Instrumentation”, 18th Edition, DhanpatRai& Company Private Limited, 2007.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EE802A.1	2	3	1	2	-	-	-	-	-	-	-	-	2	2
EE802A.2	1	1	-	3	2	2	1	-	-	-	-	-	2	-
EE802A.3	1	2	3	1	2	2	-	-	-	-	-	-	-	3
EE802A.4	2	2	2	1	3	-	-	-	-	-	-	2	2	1

PROCESS CONTROL AND INSTRUMENTATION

Code: EE802B

Contact: 3L

Credits: 3

Lectures: 33

Prerequisite: Knowledge of Control Theory

Course Objective:

This course helps the student

1. To have a knowledge on basic process control loop & characteristics
2. To understand the different controllers mode
3. To know about methods of tuning of controllers
4. To have a knowledge of final control element & different actuators
5. To apply the knowledge of Cascade, Ratio, Feed forward control to control a complicated process
6. To provide knowledge levels needed for PLC programming and operating.

Course Outcome:

Upon successful completion of the course students will be able to:

EE802B.1 Design controller by applying the knowledge of different control action

EE802B.2 Calculate controller parameters by applying different tuning methods

EE802B.3 Describe different advanced control strategy

EE802B.4 State the operation and use of final control element

EE802B.5 Develop ladder diagram

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

(i) 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 – 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

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 matrices of courses EI802.B:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
EE802B.1	3	2	2	1	2	-	1	-	1	-	2	2	2	1
EE802B.2	3	2	1	-	1	-	-	-	-	-	1	2	1	2

EE802B.3	2	1	1	-	1	-	1	1	-	-	2	-	1	1
EE802B.4	1	1	-	-	-	-	-	-	-	-	1	-	1	1
EE802B.5	3	-	3	2	1	-	-	-	-	-	2	2	2	2

Paper INDUSTRIAL & FINANCIAL MANAGEMENT
Code: HU505
Contact: 3L +1T
Credits: 4
Course Structure and Syllabus:

Syllabus Content	
Module 1	
[12L]	Introduction to Accounting a)Important Definitions b) Basic concepts and conventions c)Types of Accounts with Golden Rule of Accounting d) Journal, Ledger and Trial Balance e) Preparation of Trading Account, Profit & Loss A/C and Balance Sheet for business organizations.
Module 2	
[13L]	Financial Management Introduction to Financial Management Introduction, Definition and concept, scope, objective, functions of Finance Manager. Ratio Analysis: a) Definition, Objectives, Advantages &Disadvantages. b) 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 3	
[8L]	Cost Accounting: a)Introduction to cost accounting-Cost Centre, Cost unit, Elements of costs b)Statement of cost or cost sheet c)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 4	

[6L]	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.

Suggested Textbooks/References:

1. Financial Management, Khan & Jain, S. Chand
2. Management Accounting, Khan & Jain, S. Chand
3. Modern Accountancy, Haniff & Mukherjee, TMH
4. An Introduction to Accountancy, S.N.Maheswari, Vikas publication
5. Cost Accounting: Theory and Practices, B. Banerjee, PHI
6. Financial Management, IM Pandey, Vikas