Second YearI–Semester

Code	Subject	Category	Instruction Periods per Week (L+T+P)	Semester End Examination		Sessional Marks	Total Marks	Credits
				Duration (Hours)	Marks			
EEE 211	Engineering Mathematics-III	BS	3+1+0	3	60	40	100	3
EEE 212	Engineering Mechanics & Strength of Materials	ES	3+1+0	3	60	40	100	3
EEE 213	Electromagnetics	PC	3+1+0	3	60	40	100	3
EEE 214	Network Theory	PC	3+1+0	3	60	40	100	3
EEE 215	Electronic Devices &Circuits	PC	3+1+0	3	60	40	100	3
EEE 216	Digital Logic Design	ES	3+1+0	3	60	40	100	3
EEE 217	Networks Lab	PC	0+0+3	3	50	50	100	2
EEE 218	Electronic Devices & Circuits Lab	PC	0+0+3	3	50	50	100	2
Total			**30**	**—**	**460**	**340**	**800**	**22**

SecondYearII–Semester

Code	Subject	Category	Instruction Periods per Week (L+T+P)	Semester End Examination		Sessional Marks	Total Marks	Credits
				Duration (Hours)	Marks			
EEE 221	Engineering Mathematics-IV	BS	3+1+0	3	60	40	100	3
EEE 222	Electrical Measurements	PC	3+1+0	3	60	40	100	3
EEE 223	Performance of Electrical Machines-I	PC	4+0+0	3	60	40	100	3
EEE 224	Analog Electronic Circuits	PC	3+1+0	3	60	40	100	3
EEE 225	Signals & Systems	PC	3+1+0	3	60	40	100	3
EEE 226	Microprocessors and MicroControllers	ES	4+0+0	3	60	40	100	3
EEE 227	Electrical Measurements Lab	PC	0+0+3	3	50	50	100	2
EEE 228	Analog Electronic Circuits Lab	PC	0+0+3	3	50	50	100	2
Total			**30**	**—**	**460**	**340**	**800**	**22**

ENGINEEERING MATHEMATICS-III

EEE 211 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: At the end of the course student should be able

CO1: Understanding the concepts of Gradient, Divergence and Curl and finding scalar potential function of irrrotational vector fields.
CO2: Understanding the concepts of Green's Theorem, Stokes' Theorem and the Divergence Theorem and to evaluate line integrals, surface, integrals and flux integrals.
CO3: Understand some basic techniques for solving linear partial differential equations andhow to identify a partial differential equation in order to determine which technique(s) can best be applied to solve it.
CO4: Understand the methods to solve the Laplace, heat, and wave equations.
CO5: To gain good knowledge in the application of Fourier Transforms.

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	0	0	0	0	3	0	0	0	0	1	2	2
CO2	3	0	0	0	0	0	3	0	0	0	0	1	2	2
CO3	3	0	0	0	0	0	3	0	0	0	0	1	3	2
CO4	3	0	0	0	0	0	3	0	0	0	0	1	3	2
CO5	3	0	0	0	0	0	3	0	0	0	0	1	3	2

SYLLABUS

UNIT-I:
VECTOR DIFFERENTIATION **(12 Periods)**
Differentiation of Vectors – Scalar and Vector point function – Del applied to Scalar point functions - Gradient geometrical interpretations – Directional Derivative - Del applied to vector point function – divergence - Curl – Physical interpretation of Divergence and Curl - Del applied twice to point functions- Del applied to product of point functions.

UNIT-II:
VECTOR INTEGRATION **(12 Periods)**
Integration of vectors – Line integral – Surface – Green's theorem in the plane – Stokes theorem – Volume integral – Gauss Divergence theorems (all theorems without proofs) – Irrotational fields .

UNIT-III:

PARTIAL DIFFERENTIAL EQUATIONS (12 Periods)

Introduction – Formation of Partial Differential Equations – Solution of Partial Differential Equations by Direct Integration – Linear Equations of the First order – Higher order Linear Equations with Constant Co-efficients – Rules for finding the complementary function - Rules for finding the Particular integral – Non- Homogeneous linear equations with constant coefficients.

UNIT –IV:

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS (12 Periods)

Introduction – Method of separation of variables – Vibrations of a stretched string- Wave equation – One dimensional Heat flow - Two dimensional Heat flow – Solution of Laplace's equation.- Laplace's equation in Polar Co-ordinates.

UNIT-V:

FOURIER TRANSFORMS (12 Periods)

Introduction – definition – Fourier integral theorem - Fourier sine and cosine integrals – Complex form of Fourier integrals – Fourier integral representation of a function – Fourier Transforms – Properties of Fourier Transforms – Convolution Theorem – Parseval's identity for Fourier transforms – Fourier Transforms of the Derivatives of functions – Application of Transforms to Boundary value problems – Heat conduction – Vibrations of a string.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli, 2014.

Reference books:

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2001.
2. Advanced Engineering Mathematics by H.K.Dass ,S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

ENGINEERING MECHANICS& STRENGTH OF MATERIALS

EEE 212 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: Students will be able to

CO1: Evaluate the forces in concurrent and coplanar force systems, using various principles and also under different conditions of equilibrium. Analyze the forces in various applications and apply the concepts of friction to some basic applications of Electrical engineering.
CO2: Understand and apply principles of parallel force systems to find centroid and moment of inertia of different objects.
CO3: Apply the concepts of kinematics and kinetics to analyze force on particles under rectilinear.
CO4: Distinguish between various mechanical properties like yield strength, ultimate strength etc., of a given material and also to determine various types of direct stresses. Analyze the effect of shear force & bending moment on various beams.
CO5: Determine the bending stresses in different beams of various cross sections and to find torsional stresses in shafts

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Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	0	3	0	0	0	3	0	2	0	0	1	3	1
CO2	0	2	0	0	0	0	1	0	3	0	0	1	3	1
CO3	0	2	0	3	0	0	1	0	2	0	0	1	2	1
CO4	0	2	0	3	1	0	2	0	1	0	0	1	2	0
CO5	0	1	0	3	0	0	2	0	0	0	0	1	2	1

SYLLABUS

Part –A : Engineering Mechanics

Unit – I Statics: **(12 Periods)**
Fundamentals of Mechanics: Basic Concepts, Force Systems and Equilibrium, Moment and Couple, Principle of Superposition & Transmissibility, Varignon's theorem, Resultant of force system – Concurrent and non concurrent coplanar forces, Condition of static equilibrium for coplanar force system, concept of free body diagram, applications in solving the problems on static equilibrium of bodies.
Friction Concept of dry friction, limiting friction, angle of friction, Friction problems related to connecting bodies and ladder.

Unit – IIProperties of bodies: **(10 Periods)**
Center of Gravity: Center of Gravity of Plane figures, Composite Sections and shaded areas.

Area Moment of Inertia: Parallel and Perpendicular axis theorem, Moment of Inertia of symmetrical and unsymmetrical sections

Unit – III<u>Dynamics:</u> **(08 Periods)**

Kinematics – Introduction to kinematics, Equations of motion for uniform and variable motion; Projectiles.

Kinetics – D'Alembertsprinciple, Work energy method, Impulse momentum methods.

<u>Part – B :</u>

Unit – IV Strength of Materials **(15 Periods)**

Simple Stresses and Strains: Stresses and Strains, stress-strain curve, Bars of uniform, varying and tapered cross –sections, Poisons ratio, volumetric strain and relation between moduli of elasticity

Shear Force and Bending Moment: Cantilever, Simply Supported and Overhanging beams subjected to point loads and uniformly distributed loads.

Unit – V **(15 Periods)**

Bending stresses in beams: Theory of pure bending, Flexure formula, Section modulus for cantilever and simply supported beams having symmetrical and unsymmetrical sections

Torsion of Shafts: Torsion equation for circular shaft, polar modulus and related problems.

Text Books:

1. Engineering mechanics by Bhavikatti. New age international.
2. Engineering mechanics by A.K. Tayal.
3. S.Ramamrutham& R, Narayanan, Strength of Materials, DhanpatRai publications.
4. R.K.Bansal "A Text Book of Strength of Materials, Lakshmi Publications Pvt. Ltd,New Delhi

References:

1. Engineering Mechanics by S.Timoshenko and D.H. Young McGraw-Hill.
2. Mechanics of Materials by E P Popov
3. Dr Sadhu Singh,Strength of Materilas.

ELECTROMAGNETICS

EEE 213 **Credits: 3**

Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL-2	**Define** various coordinate systems and **Apply** Coulomb's law and Gauss law to **Determine** electric field intensity and electric flux density for various charge distributions
CO2	BL-2	**Explain** energy density in electrostatics, properties of conductors and dielectrics and to **Solve** capacitance of composite parallel capacitors.
CO3	BL-3	**Apply** Poisson's and Laplace's equations to **Solve** boundary value problems and **Apply** Biot-Savart's law and Ampere's circuital law to **Determine** magnetic field intensity and magnetic flux density for various current distributions
CO4	BL-3	**Apply** Lorentz force equation to **Determine** force and torque on a closed path and **Explain**properties of magnetic materials to **Solve** inductance of different configurations
CO5	BL-2	**Explain** Faraday's law of electromagnetic induction and **Discuss** wave equation in different mediums and Pointing theorem

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	2	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	2	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	2	-

JUSTIFICATION STATEMENT FOR CO-PO MAPPING			
COs	**POs**	**Level**	**Description**
CO1	PO1	3	Coordinate systems, Coulomb's law and Gauss law are explained with the knowledge of fundamentals of basic electrical engineering and mathematics.
CO1	PO2	2	Based on Coulomb's law and Gauss law, determine the force and electric field intensity due to several charge distributions.
CO1	PO12	1	Recognize the need of electric field intensity in the field of electromagnetic waves
CO1	PSO1	2	Electric field intensity calculations are helpful in developing the capacitance of power transmission lines.
CO2	PO1	3	Properties of conductors and dielectrics are described with the knowledge of fundamentals of basic electrical engineering and mathematics.
CO2	PO2	2	Calculate the capacitance for parallel palace capacitor and composite parallel plate capacitors
CO2	PO12	1	Recognize the need of capacitance calculations in modeling the power transmission lines.

CO2	PSO1	2	Capacitance calculations are helpful in modeling of power lines.
CO3	PO1	3	Biot-Savart's law and Ampere's circuital law are explained with the knowledge of fundamentals of basic electrical engineering and mathematics.
CO3	PO2	2	Poisson's and Laplace's equations are useful in solving the boundary value problems.
CO3	PO12	1	Recognize the need of magnetic field intensity in the field of electromagnetic waves
CO3	PSO1	2	Magnetic field intensity calculations are helpful in developing the inductance of power transmission lines.
CO4	PO1	3	Lorentz force equation is developed with the knowledge of fundamentals of basic electrical engineering and mathematics.
CO4	PO2	2	Evaluate the inductance for different configurations such as solenoid, toroid and coaxial cable.
CO4	PO12	1	Recognize the need of inductance calculations in modeling the power transmission lines.
CO4	PSO1	2	Inductance calculations are helpful in modeling of power lines.
CO5	PO1	3	Faraday's laws of electromagnetic induction are explained with the knowledge of fundamentals of basic electrical engineering and mathematics.
CO5	PO2	2	Develop the three dimensional wave equations in free space and for harmonically varying fields.
CO5	PO12	1	Recognize the need Faraday's law in describing the operation of electrical machines.
CO5	PSO1	2	Wave equation is helpful in describing the wave propagation on power transmission lines.

SYLLABUS

UNIT-I [14 Periods]

Co-ordinate systems: Cartesian, Cylindrical and Spherical coordinate systems, Coordinate transformations, **Static electric fields:** various types of charge distribution, the experimental law of Coulomb, Electric field intensity, Electric field intensity due to infinite line, infinite surface charge distributions. Electric flux density, Gauss law and its applications, point form Gauss law.

UNIT-II [14 Periods]

Absolute Electric potential, potential difference, potential gradient, calculation of potential difference for point charge and infinite line charge distributions. Electric dipole, Energy density in electrostatic field, current, current density, continuity equation of current, point form of ohm's law, properties of conductors and boundary conditions, properties of dielectrics and boundary conditions, capacitance, parallel plate capacitor, composite parallel plate capacitor, energy stored in capacitor.

UNIT-III [12 Periods]

Poisson's and Laplace's equations, one-dimensional solutions of Laplace's equations, applications of Poisson's and Laplace's equations, method of images, **Static magnetic fields:** types of current distributions (line current, surface current and volume current), Biot-Savart law, magnetic field intensity due to straight conductor, circular loop, infinite sheet of current**.** Ampere's circuital law and applications, point form of Ampere's circuital law, magnetic flux and magnetic flux density, scalar and vector magnetic potentials.

UNIT-IV **[10 Periods]**

Integral and differential forms of Maxwell's equations for static fields, Lorentz force equation, Force on a moving charge, Force on a differential current element, Force between current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetic boundary conditions, energy stored in magnetic field, Inductance and mutual inductance, Inductance evaluation for solenoid, toroid, coaxial cables

UNIT-V **[10 Periods]**

Time varying fields: Faraday's law of Electromagnetic induction, statically induced e.m.f, dynamically induced e.m.f, modified ampere's circuital law for time varying fields, displacement current, integral form and differential forms of Maxwell's equations for time varying fields, wave equation in free space, wave equation for harmonically varying fields, uniform plane wave equation, intrinsic impedance, Poynting theorem and power considerations.

TEXT BOOKS:

1. William H Hayt and Jr John A Buck, "Engineering Electromagnetics" , Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2008
2. Sadiku M. H, "Principles of Electromagnetics", Oxford University Press Inc, New Delhi, 2009
3. Narayana Rao N., "Elements of Engineering Electromagnetics" Fourth Edition Prentice Hall of India, New Delhi 1998.

RFERENCE BOOKS:

1. David K Cheng, "Field and Wave Electromagnetics", Pearson Education Inc, Delhi, 2004
2. John D Kraus and Daniel A Fleisch, "Electromagnetics with Applications", Mc Graw Hill Book Co, 2005.
3. Karl E Longman and Sava V Savov, "Fundamentals of Electromagnetics", Prentice Hall of India, New Delhi,2006

NETWORK THEORY

EEE 214 | **Credits: 3**

Instruction: 3 periods & 1 Tut / Week | Sessional Marks: 40

End Exam: 3 Hours | End Exam Marks: 60

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL-3	**Apply** network theorems and **calculate** various parameters of D.C and A.C circuits.
CO2	BL-4	**Analyze** the behavior of magnetically coupled circuits, Two port network and **Calculate** various parameters of two port network
CO3	BL-4	**Analyze** natural and forced response of electric circuits.**Determine** transient and steady state response of RL ,RC and RLC circuits
CO4	BL-4	**Explain** circuits under resonant condition and **Determine** parameters of series and parallel RLC circuits.
CO5	BL-4	**Synthesize** one port and two port networks and **Determine** passive elements of the network

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1-	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	1	-	-	-	-	-	-	1	1	-
CO2	2	3	1	-	1	-	-	-	-	-	-	1	2	-
CO3	2	3	1	-	1	-	-	-	-	-	-	1	1	-
CO4	2	3	1	-	1	-	-	-	-	-	-	1	1	-
CO5	2	3	1	-	1	-	-	-	-	-	-	1	1	-

JUSTIFICATION STATEMENT FOR CO-PO MAPPING			
COs	**Pos**	**Level**	**Description**
CO1	PO1	3	Solve problems for different theorems with the knowledge of basic electrical engineering, mathematics.
CO1	PO2	3	With basic laws and theorems analysis of various types of electrical circuits.
CO1	PO3	2	Providing solutions to various electrical circuits.
CO1	PO5	1	Simulate various circuits using matlab.
CO1	PO12	1	Recognize the need of networks and theorems to design powersystems.
CO1	PSO1	1	Analysis and application of theorems in order to simplify powersystem.
CO2	PO1	2	Analyze twoport networks and magnetically coupled circuits with the knowledge of basic electrical engineering, mathematics.
CO2	PO2	3	Analysis of transmission line parameters , magnetically coupled circuits
CO2	PO3	1	Design of T Parameters for transmission lines in power systems
CO2	PO5	1	Simulation of various networks using Mat lab
CO2	PO12	1	Recognize the need of analysis of two port parameters in power systems.

CO2	PSO1	2	Design Power system components using T-parameters.
CO3	PO1	2	Evaluate the natural and forced response of circuits with the knowledge of basic electrical engineering, mathematics.
CO3	PO2	3	Analyze the behavior of inductor, and capacitor in autonomous stage.
CO3	PO3	1	Design circuits with charged passive elements
CO3	PO5	1	Simulate the transient behavior of networks using Mat lab
CO3	PO12	1	Recognize the need of transients in power systems.
CO3	PSO1	1	Analyzing Power system transients under fault condition
CO4	PO1	2	Frequency response of RLC circuits can be obtained with the knowledge of basic electrical engineering, mathematics.
CO4	PO2	3	Analysis of three phase circuits under balanced and unbalanced loads
CO4	PO3	1	Designing of circuits, elements having a particular specified F_r , bandwidth.
CO4	PO5	1	Simulate three phase circuits using Matlab
CO4	PO12	1	Recognize the need of three phase circuits and frequency response of elements to design power systems.
CO4	PSO1	1	Analyzing resonant behavior of Power system
CO5	PO1	2	Synthesize the functions with the knowledge of basic electrical engineering, mathematics.
CO5	PO2	3	Analysis of elements by synthesizing the given transfer function
CO5	PO3	1	Design elements by applying different synthesizing methods
CO5	PO5	1	Design dual networks and mathematical modeling using Mat lab
CO5	PO12	1	Recognize the need of Laplace transforms to design power systems
CO5	PSO1	1	Application of Laplace transforms in Power systems

SYLLABUS

UNIT-I: (15 periods)

Independent & Dependent Sources, Mesh Analysis, Nodal Analysis, Application of Superposition, Thevenin's, Norton's, Maximum power transfer and Milman's theorems to both D.C and A.C circuits.

UNIT-II: (11 periods)

Coupled Circuits: Magnetically coupled circuits,Dot convention.

Two-port Networks: Z, Y, H, T Parameters of two port networks, reciprocity theorem.

UNIT-III: (14 periods)

DC Transients: Source free RL & RC circuits, Driven RL & RC circuits, Natural and forced response of RL & RC circuits. Source free and driven RLC circuits, Natural and forced response of RLC circuits.

UNIT-IV: (12 periods)

Resonance: Series and parallel resonant circuits, bandwidth and Q-factor.

Three Phase circuits: Balanced and unbalanced circuits.

UNIT-V: (12 periods)

Concept of Duality, initial and final value theorems in s-domain, Application of Laplace transforms to electrical circuits.

Network Topology: Definitions – Graphs, Tree, Basic cut set and basic tie set matrices for planar or non-planar networks.

Network Synthesis: Elementary Synthesis Operation, LC Network Synthesis, Properties of RC

Network Functions, Foster and Cauer Forms of RC and RL Networks.

Text books:

1. W. H. Haytjr& J. E. Kemmerly, Engineering circuit analysis, 7th edition, Mc.graw hill publications 2006.
2. M. E. Vanvalkunberg, Network analysis, 3rd edition, prentice Hall of India 1974.
3. M. E. Van valkunberg, Modern Network analysis.

REFERENCES:

1. C K *Alexander* & M. N. O. *Sadiku, Fundamentals of Electric Circuits, 5th Edition,* Published by McGraw-Hill.
2. Engineering *Network Analysis* & Filter Design by *GOPAL.G. BHISE*,UmeshPublications,publishers of science and technical books.

ELECTRONIC DEVICES & CIRCUITS

EEE 215 **Credits: 3**

Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: By the end of this course, student will be able

CO1: Design simple electronic circuits to accomplish a specific function.
CO2: Understand the voltage regulation.
CO3: Understand the working of transistors.
CO4: Design and analyze the basic amplifier circuits with proper bias stabilization.
CO5: Choose an appropriate device for given applications and use it satisfactorily

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	3	2	0	0	0	0	0	2	0	0	1	3	2
CO2	1	0	0	3	0	0	0	0	0	0	0	1	2	2
CO3	3	2	1	2	1	0	0	0	0	0	0	1	2	2
CO4	1	3	2	3	0	0	0	0	1	0	0	1	2	2
CO5	1	0	0	0	0	0	3	0	0	0	0	1	2	2

SYLLABUS

Unit1:PN junction diode and its applications **(10 periods)**

Open circuited p-n junction, biased p-n junction diode, energy band diagram of PN junction Diode, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Transition and Diffusion capacitance of diode.

Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factorand Regulation Characteristics.

Unit 2:Special Semiconductor Devices **(8 periods)**

Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Photo diode, Varactor diode, Tunnel Diode, Schottky barrier diode, UJT.Construction, operation and characteristics of all the diodes.

Unit 3:Transistor Characteristics **(12 periods)**

Junction transistor, transistor current components, transistor as an amplifier, transistor configurations, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Comparison of CE, CB and CC Configurations.α,β and γ Parameters and the relation between them, typical transistor junction voltage values.

Unit4: FET **(10 periods)**

FET types, construction, operation, characteristics, parameters, FET as a Voltage variable resistor, MOSFET-types, construction, operation, characteristics, comparison between BJT,JFET and MOSFET.

Unit 5: Transistor Biasing and Thermal Stabilization (10 periods)

Need for biasing, operating point, load line analysis, BJT biasing methods-fixed bias, collector to base bias, self bias. Bias compensation, Thermal runaway, Thermal stability. FET Biasing-methods and stabilization.

Text Books:

1. Electronic Devices and Circuits, Jacob Millman and D. Halkias, McGraw Hill.
2. Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications.

References:

1. Electronic Devices and Circuits-David A.Bell, Oxford University Press, Fifth Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D. Parikh, Tata Mc-Graw Hill, 2009.

DIGITAL LOGIC DESIGN

EEE 216	**Credits: 3**
Instruction: 3 periods & 1 Tut / Week	Sessional Marks: 40
End Exam: 3 Hours	End Exam Marks: 60

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL3	**Apply** Boolean algebra theorem for **Conversion** of number system to simplify the logic expression .
CO2	BL3	**Applying** K-Map and tabulation method to simplify the logic expression
CO3	BL4	**Design** and **Analyze** the synchronous sequential circuits including Registers and Counters using Gates and Flip flops
CO4	BL3	**Demonstrate** the procedural steps for implementation of synchronous and asynchronous sequential circuits.
CO5	BL3	**Realize, compare** and **Develop** programming tables of Programmable Logic Devices

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											1		2
CO2	2	2	2		1									2
CO3	2	2	2	2								1		2
CO4	2	3	2									1		2
CO5	2	3	2									1		2

Justification Statements for CO-PO Mappings			
CO	**PO**	**LEVEL**	**DESCRIPTION**
CO-1	PO-1	2	Conversion and Simplify the logic expressions by applying the knowledge of Engineering Fundamentals.
CO-1	PO-12	1	Recognize the need of Digital Logic circuits in the field of Digital Application.
CO-2	PO-1	2	Implement the logic circuits by using K-Map with knowledge of Basic Engineering.
CO-2	PO-2	2	Formulate the circuits by using Boolean expression
CO-2	PO-3	2	Design logic circuits using Tabulation method for complex engineering problems.
CO-2	PO-5	1	Develop complex logic Circuits using Modern tool like MATLAB
CO-3	PO-1	2	Simplify the logic expressions by applying the knowledge of Engineering Fundamentals
CO-3	PO-2	2	Analyze the complex engineering problems related to Sequential Circuits using different Flip flops
CO-3	PO-3	2	Design the complex engineering problems related to Sequential Circuits using different Flip flops
CO-3	PO-4	2	Design laboratory Experiments using Filp Flops

CO-3	PO-12	1	Recognize the need of Digital Logic circuits in the field of Digital Applications
CO-4	PO-1	2	Simplify the logic expressions by applying the knowledge of Engineering Fundamentals.
CO-4	PO-2	3	Analyze the complex engineering problems related to Sequential Circuits using different Flip flops
CO-4	PO-3	2	Design the complex engineering problems related to Sequential Circuits using different Flip flops
CO-4	PO-12	1	Recognize the need of Digital Logic circuits in the field of Digital Applications
CO-5	PO-1	2	Realization of Switching functions using basic Logic Gates by applying Basic Engineering Fundamentals.
CO-5	PO-2	3	Analyze the problems related to practical application using PLA,PAL,PROM
CO-5	PO-3	2	Design the problems related to practical application using PLA,PAL,PROM
CO-5	PO-12	1	Recognize the need of Digital Logic circuits in the field of Digital Applications

SYLLABUS

UNIT-I

Binary Systems, Boolean Algebra and Logic Gates **(12 periods)**

Digital Systems, Binary Numbers, Number Systems, Base Conversion Methods, Complements, Signed Binary Numbers, Binary Codes, Binary Logic.

Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra. Boolean Functions, Canonical and Standard Forms, Different Logic Operations, Digital Logic Gates.

UNIT- II

Gate-Level Minimization **(10 periods)**

The Map Method, Minimal Functions and their properties, Don't-Care Conditions, Tabulation Method, NAND and NOR Implementation.

Combinational Logic Design: **(10 periods)**

Combinational Circuits, Analysis Procedure, Design Procedure, Design of adders, subtractors, adder-subtractor circuit, BCD adder circuit, applications of adders, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers.

UNIT- III

Sequential Logic Circuits **(8 periods)**

Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, Flip-Flop Conversions.

Registers and Counters **(6 periods)**

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Johnson and Ring counters,

UNIT IV

Synchronous Sequential Logic **(5 periods)**

Basic Design Steps, Serial Adder Example, State Reduction & Assignment Problem.

Fundamentals of Asynchronous Sequential Logic **(5 periods)**

Introduction, Analysis Procedure, Design Procedure, circuits with latches, Races and Hazards.

UNIT-V:

Programmable Logic Devices **(8 periods)**

Programmable Logic Devices : PROM, PLA, PAL, realization of switching functions using PROM, PLA and PAL; comparison of PROM, PLA and PAL, Programming tables of PROM, PLA and PAL, Sequential Programmable Devices.

Text Books :

1. M. Morris Mano, Digital Design, 4th Edition, Pearson Education, Inc., 2008

Reference Books:

1.John F Wakerly, Digital Design Principles and Practice, 3rd Edition, Pearson.
2. Frederick, Introduction to Switching Theory and Logical Design, 3rd Edition,2011 & J. Hill and Gerald R. Peterson, John Wiley and Sons, 2011.
3. William I. Fletcher, An Engineering Approach to Digital Design, PHI, 2008.

NETWORKS LAB

EEE 217 **Credits: 2**

Instruction: 3 periods / Week Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: 50

Course Outcomes: At the end of the course the student will be able to:

COs	BLs	CO Statement
CO1	BL-3	**Demonstrate** KCL, KVL,Thevenin's theorem,Norton's theorem, Maximum Power transfer theorem, Superposition theorem and Millman's theorem to **Examine** the response in network elements.
CO2	BL-4	**Analyze** the coupled circuits, series and parallel resonance RLC circuits to **Determine** the self-inductance, mutual inductance and coefficient of coupling, resonant frequency, quality factor and band width.
CO3	BL-3	**Test** theReciprocity theorem and **Determine** the parameters of two port network

Program Matrix

	Program Outcomes (POs)												**PSOs**	
COs	**Domain Specific POs**					**Domain Independent POs**								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	3		1			1	1		1	1	1
CO2	2	3	1	3		1			1	1		1	1	1
CO3	2	3	1	3		1			1	1		1	1	1

S.No	Name of the Experiment	CO's
1	Verification of ohm's law and filament lamp characteristics.	CO1
2	Verification of Kirchhoff's Laws.	CO1
3	Verification of superposition theorem.	CO1
4	Verification of Thevenin's Theorems.	CO1
5	Verification of Maximum power transfer theorem.	CO1
6	Verification of Norton's theorem.	CO1
7	Verification of Milliman's Theorem.	CO1
8	Verification of reciprocity theorem.	CO3
9	Resonance of series and parallel R-L-C circuits.	CO2
10	Two Port network parameters.	CO3
11	Calculation of self & mutual inductances, Co-efficient of coupling.	CO2

ELECTRONIC DEVICES & CIRCUITS LAB

EEE 218 **Credits: 2**

Instruction: 3 periods / week Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: 50

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the use of RPS and CRT.
CO2: Verify the working of diodes, transistors and their applications.
CO3: Set up a bias point in a transistor
CO4: Design simple hardware circuits using diodes and transistors.
CO5: Design simple DC power supply circuits.

Program Matrix

COs	**Program Outcomes (POs)**												**PSOs**	
	Domain Specific POs					**Domain Independent POs**								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	0	0	0	0	0	0	1	0	0	1	3	-
CO2	0	3	1	2	0	0	2	0	1	0	0	1	2	-
CO3	1	0	0	0	0	0	0	0	2	0	0	1	2	-
CO4	0	3	3	0	0	0	2	0	2	0	0	1	2	-
CO5	1	3	3	1	0	0	0	0	1	0	0	1	-	-

LIST OF EXPERIMENTS

1. Study of CRO and Applications
2. V-I Characteristics of PN Junction Diode
3. V-I Characteristics of Zener Diode and Zener regulator characteristics.
4. V-I Characteristics of LED
5. Half-wave rectifier without and with filter
6. Full-wave rectifier without and with filter
7. Characteristics of BJT in CB configuration, h-parameters
8. Characteristics of BJT in CE configuration, h-parameters
9. Drain and transfer characteristics of JFET
10. Transistor as a switch
11. Implementation of logic gates using diodes and transistors.
12. SCR Characteristics

ENGINEERING MATHEMATICS-IV

EEE 221 **Credits: 3**

Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: At the end of the course student should be able to:

CO1: Understanding the characteristics and properties of Z-transforms and apply the concep of Z-Transform in Digital Systems.	
CO2: Familiarize the formation of Difference Equations and method of solving difference equations.	
CO3: Understand, interpret and use the basic concepts: analytic function, harmonic function, Taylor and Laurent series, singularity.	
CO4: Study the concepts of Residues, evaluating definite integrals using technique of residue and understand the concepts of conformal mappings.	
CO5: Analyze the Statistical data by using statistical tests (based on small sample and largesample) and to draw valid inferences based on the analysis of statistical data.	

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	0	0	0	0	3	0	0	0	0	1	3	3
CO2	3	0	0	0	0	0	3	0	0	0	0	1	3	3
CO3	3	0	0	0	0	0	3	0	0	0	0	1	3	3
CO4	3	0	0	0	0	0	3	0	0	0	0	1	3	3
CO5	3	0	0	0	0	0	3	0	0	0	0	1	3	3

SYLLABUS

UNIT -I :

FUNCTIONS OF A COMPLEX VARIABLE **(14 Periods)**

Introduction –Limit of a Complex function- Derivative of $f(z)$ – Analytic functions-Harmonic functions - Applications to Flow problems. Complex Integration- Cauchy's Theorem- Cauchy's Integral Formula –Series of Complex terms(Statements of Taylor's and Laurent's Series without proof) - Zeros of an Analytic function - Residues- Calculation of Residues - Evaluation of Real Definite Integrals (Integration around the unit circle, Integration around the small semi circle , Indenting the Contours having poles on the real axis).

Geometric representation of $f(z)$, Some standard transformation $(w = z + c, w = cz, w = \frac{1}{z}, w = \frac{az+b}{cz+d})$.

UNIT –II:

FINITE DIFFERENCES & INTERPOLATION **(12 Periods)**

Finite Differences – Forward differences – Backward differences – Central differences – Differences of a Polynomial – Factorial Notation – Other difference operators – To find one or more missing terms – Newton's Interpolation Formulae – Central Difference Interpolation Formulae - Interpolation with Unequal Intervals – Lagrange's interpolation formula – Inverse Interpolation.

UNIT-III:
NUMERICAL DIFFERENTIATION AND INTEGRATION (10 Periods)

Numerical Differentiation – Formulae for derivatives – Maxima and Minima of a Tabulated Function – Numerical Integration – Newton-Cotes Quadrature Formula – Trapezoidal rule – Simpson's One-Third rule , Simpson's Three-Eighth rule.

UNIT–IV:
Z – TRANSFORMS (12 Periods)
Introduction – Definition - Some Standard Z-Transforms –Linearity Property –Damping Rule – Some Standard Results - Shifting U_n to the right , Shifting U_n to the left – Two basic theorems (Initial Value Theorem and Final Value Theorem) – Convolution Theorem – Convergence of Z-transforms – Two sided Z - transform of U_n - Evaluation of inverse Z- transforms (Power Series Method , Partial Fraction Method , Inverse integral method) - Applications to Difference equations.
UNIT -V :
SAMPLING THEORY (12 Periods)
Introduction – Sampling Distribution – Testing a hypothesis – Level of Significance – Confidence Limits – Test of Significance of Large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown – Small samples – Students t-distribution – Significance test of a sample mean – Significance test of difference between sample means – Chi-Square (χ^2) Test – Goodness of fit.
Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli.

Reference books:
1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2011.
2. Advanced Engineering Mathematics by H.K.Dass ,S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

ELECTRICAL MEASUREMENTS

EEE 222 **Credits: 3**

Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: At the end of the course the student will be able to:

CO1	BL-3	**Apply** basic electrical engineering concepts to **Determine** the shunts and multipliers required to extend the range of instruments.
CO2	BL-3	**Apply** compensation techniques to **compensate** the errors while measuring power and energy by using measuring instruments.
CO3	BL-4	**Analyze** the behavior of the bridges to **Measure** R,L,C and frequency when any changes are occurred in the arms of the bridges.
CO4	BL-3	**Apply** the concepts of Electromagnetic circuits to **Determine** B-H curve of coils.
CO5	BL-3	**Illustrate**theconcepts of Potentiometers, CT's and PT's to **Determine** the error.

Program Matrix

	Program Outcomes (POs)												**PSOs**	
COs	**Domain Specific POs**					**Domain Independent POs**								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										1		
CO2	3	2		1								1		
CO3	3	2	1	1								1		
CO4	2	1										1		
CO5	2	2	1	1								1		

JUSTIFICATION STATEMENT FOR CO-PO MAPPING			
COs	**POs**	**Level**	**Description**
CO1	PO1	3	Operation of electromechanical and electrostatic meters is illustrated with the knowledge ofbasic electrical engineering, mathematics and sciences.
CO1	PO2	2	Based on the extension range of meters, the shunts and multipliers are determined.
CO1	PO12	1	Recognize the need of meters for doing experimental setup in power systems, power electronics and drives.
CO2	PO1	3	Operation of watt meters, energy meters, power factor meters, frequency meters and synchroscopewith the knowledge ofbasic electrical engineering, mathematics and sciences
CO2	PO2	2	The errors in energy meters and watt meters are identified and analyzed, by using compensation techniques these errors are reduced.
CO2	PO12	1	Recognize the need of Compensation techniques to reduce errors in energy and power measurement
CO3	PO1	3	R, L, C and frequency are calculated by using bridges with the knowledge of basic electrical engineering, mathematics.

CO3	PO2	2	The errors in bridge due to environmental changes are identified and the behavior of the bridge with respect to temperature variations is analyzed.
CO3	PO3	1	The two independent variables of the bridge are designed to measure unknown R, L, C and Frequency.
CO3	PO12	1	Recognize the need of bridge analysis to determine unknown elements like R, L, C and frequency.
CO4	PO1	2	The operations of various magnetic measuring instruments are illustrated with the knowledge of basic electrical engineering.
CO4	PO2	1	The variation in the flux due to change in current through a coil is identified and the behavior of thecore is analyzed using B-H curve.
CO4	PO12	1	Recognize the need of B-H curve to analyze the behavior of magnetic material.
CO5	PO1	2	The operation of Potentiometers, CTs and PTs are illustrated with the knowledge of basic electrical engineering concepts.
CO5	PO2	2	The errors in CTs and PTs and errors in meters using Potentiometers are identified and those errors are analyzed with the help of basic electrical engineering.
CO5	PO3	1	Ratings of CTs and PTs are designed based on operating current and voltage of protection equipment.
CO5	PO12	1	Recognize the need of Potentiometers to calibrate the meters and to measure unknown resistance, inductance and power. Recognize the need of CTs and PTs to measure high voltages and currents in substations.

SYLLABUS

UNIT-I **(10 periods)**

Instruments: Objectives of Measurements, Analog Versus Digital Measurements, Sources of Measurement Error, Static characteristics of Measuring Instruments, Instruments: Ammeter, Voltmeter, Expression for Torque of Moving Coil, Moving Iron, Dynamometer, and Electrostatic Instruments. Extension of range of Instruments.

UNIT-II **(10 periods)**

Measurement of Power and Energy: Dynamometer type Wattmeter's and Torque Expression. Measurement of reactive Power. Single Phase Induction type Energy Meters. Driving Torque and Braking Torque Equations, Errors and Compensation, Power Factor Meters, Frequency Meters, Electrical Resonance and Weston type of SynchroScope.

UNIT-III **(18 periods)**

Bridge Methods: Measurement of Resistance by Using Wheatstone's bridge, Kelvin's Double Bridge, Loss of Charge Method and Megger. Measurement of Inductance by Using Maxwell's Inductance, Maxwell's Inductance-Capacitance, Anderson's, Owen's and Hays Bridge, Measurement of Frequency by Using Wien's bridge. Measurement of Capacitance by Using Desauty's and Schering's Bridges. Wagner's Earthing Device.

UNIT-IV **(12 periods)**

Magnetic Measurements: CalibrationofBallistic Galvanometer using Hibbert's magnetic standard, Flux Meter operation, extension range of Flux meters, Determination of Leakage Factor by using Flux Meter. Determination of B-H Curve and Hysteresis Loop Using CRO.

UNIT-V **(10 periods)**

Potentiometers: Basic slide wire potentiometer,Crompton's D.C. Potentiometer, A.C. Polar and co-ordinate Type Potentiometers Applications of DC and AC potentiometers. Use of potentiometerin Frequency, Phase and Amplitude measurements.

Instrument Transformers: CTs, PTs - Ratio and Phase angle errors and their reduction.

Text Book:

1. A.K. Sawhney, Electrical and Electronic Measurements and Instrumentation, DhanpatRai& Sons, Delhi, 19th Edition, 2011.

Reference Books:

1. E.W.Golding&Widdis, Electrical Measurements, 5th Edition, Wheeler Publishing.
2. J.B Gupta, Electrical Measurements and Measuring Instruments.
3. Electronic Measurements by Hellfric& Cooper.

PERFORMANCE OF ELECTRICAL MACHINES–I

EEE 223 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL-2	**Describe** construction and operation of DC machines and **Examine** armature reaction, commutation to **Determine** the compensating winding and inter poles
CO2	BL-3	**Explain** characteristics and speed control DC motor and **Analyze** starting and starters to **Determine** the starter resistance and number of starter sections
CO3	BL-3	**Analyze** the different testing methods to **Determine** the losses and efficiency of DC machine
CO4	BL-3	**Describe** construction and operation of single phase transformers and **Analyze** the transformers to **Determine** voltage regulation and efficiency
CO5	BL-2	**Explain** three winding transformer, poly phase connections, tap changing and cooling methods and **Discuss** Scott connection and auto transformers

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	3	2	-	2	-	-	-	-	-	-	1	-	2
CO3	2	3	2	-	-	-	-	-	-	-	-	1	-	2
CO4	2	3	2	-	-	-	-	-	-	-	-	1	2	-
CO5	2	3	2	-	1	-	-	-	-	-	-	1	2	-

JUSTIFICATION STATEMENT FOR CO-PO MAPPING			
COs	POs	Level	Description
CO1	PO1	2	Construction and operation of DC machines are explained with the knowledge of fundamentals of basic electrical engineering and mathematics.
CO1	PO2	3	With the knowledge of armature reaction and commutation, analyze demagnetization, cross magnetization and sparking and determine compensating winding and inter poles
CO1	PO12	1	Recognize the need of parallel operation of generators in electric power generation and transmission
CO2	PO1	2	Characteristics of the motors are explained with the knowledge of fundamentals of basic electrical engineering and mathematics
CO2	PO2	3	Analyze the starting of DC motors and starters to determine the starting resistance and number of starter sections
CO2	PO3	2	Analyze the speed control of DC motors to develop different controllers for speed control
CO2	PO5	2	Develop the different controllers in MATLAB environment for speed control of DC motors

CO2	PO12	1	Recognize the need of speed control of motors in the field of electric drives
CO2	PSO2	2	Analyze the speed control methods and starting of motors and design controlling techniques in the field of electric drives
CO3	PO1	2	Losses and efficiency of the DC machine are explained with the knowledge of fundamentals of basic electrical engineering and mathematics
CO3	PO2	3	Analyze the testing methods of DC machine to determine the losses and efficiency of the machine
CO3	PO3	2	Analyze the testing methods to develop performance of the machines
CO3	PO12	1	Recognize the need of testing methods in the field of electrical engineering
CO3	PSO2	2	Analyze the testing methods to find the efficiency of motors as a part of components in the field of electric drives
CO4	PO1	2	construction and operation of single phase transformers are explained with the knowledge of fundamentals of basic electrical engineering and mathematics
CO4	PO2	3	Analyze the transformer to determine its regulation and efficiency
CO4	PO3	2	Analyze the parallel operation of transformers to develop the load sharing
CO4	PO12	1	Recognize the need of parallel operation of transformers in the field of power systems
CO4	PSO1	2	Determine voltage regulation and efficiency of transformers and load sharing during the parallel operation of transformers as a part of power system components
CO5	PO1	2	three winding transformer, poly phase connections, tap changing, cooling methods and auto transformers are explained with the knowledge of fundamentals of basic electrical engineering and mathematics
CO5	PO2	3	Analyze the Scott connection to determine the phase conversion from three phase to two phase
CO5	PO3	2	Analyze the poly phase connections to develop phase shifting on primary and secondary sides of different three phase transformer connections
CO5	PO5	1	Develop the poly phase connections in MATLAB environment to determine the phase shifting
CO5	PO12	1	Recognize the cooling methods and tap changing of transformers in the field of power systems
CO5	PSO1	2	Determine phase shifting in poly phase connections and develop auto transformer connections as a part of power system components

SYLLABUS

UNIT – I **(14 Periods)**

DC Generators: principles of operation, constructional features, generated e.m.f., voltage induced in d.c. machine, collection and flow of current from armature, commutation process and interpoles, armature reaction and effect on main flux and commutation, compensating winding, methods of excitation, open circuit characteristics, external characteristics of generators, parallel operation

UNIT – II **(10 Periods)**

D.C. Motors: torque expression**,** torque and speed equations, characteristics of different motors, speed control of d.c. motors, starting and starters.

UNIT – III **(16 Periods)**

Testing of D.C. Motors:losses and efficiency, brake test, Swinburne's test, Hopkinson's test, Retardation test, field's test, separation of losses.

UNIT – IV **(12 Periods)**

Single phase Transformers: principles of operation, constructional features, equivalent circuit, vector diagram, voltage regulation and efficiency, parallel operation and load sharing,

UNIT – V **(12 Periods)**

Polyphase transformers:
Three winding transformers, poly phase connections and scott connection, tap changing, cooling methods and transformer oil, Auto transformers.

TEXT BOOKS:

1. Nagarath and Kotari, Electrical Machines, TMH Publishers.
2. Dr. P.S. Bimbhra, " Electrical Machinery", Khanna publishers 2004.
3. Clayton and Hancock, "Performance and Design of Direct Current Machines", CBS publishers 2004.
4. M .G Say, "The Performance and Design of Alternating Current Machines", CBS Publishers.

REFERENCE BOOKS:

1. S.K. Bhattacharya, "Electrical Machines", Tmh, 1998

ANALOG ELECTRONIC CIRCUITS

EEE 224 **Credits: 3**

Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: At the end of the course the student will be able to:

CO1: Perform the analysis of small signal and low frequency hybrid model circuits.
CO2: Determine various parameters of an amplifier like gain, input impedance and output impedance and bandwidth.
CO3: Know about various distortions that occur in amplifiers.
CO4: To apply the concepts of feedback analysis to the design of amplifiers to meet or exceed stated specifications.
CO5: To design and analyze tuned amplifiers and oscillators to meet or exceed stated specifications.

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	3	3	2	0	0	1	0	0	0	0	1	-	3
CO2	3	0	0	3	0	0	1	0	1	0	0	1	3	-
CO3	1	0	0	3	0	0	0	0	1	0	0	1	1	-
CO4	1	2	0	2	0	0	0	0	0	0	0	1	1	2
CO5	0	3	3	0	0	0	0	0	2	0	0	1	-	3

SYLLABUS

UNIT1: Single stage Amplifiers **(12 Hrs)**

Transistor hybrid model, determination of hparameters,generalized analysis of transistoramplifier model using h-parameters, Analysis of CB, CE and CC amplifiersusing exact and approximate analysis. FET small signal model.Analysis of Common source amplifier.

UNIT2:Multi stage Amplifiers **(10Hrs)**

RC Coupled Amplifiers using BJT and FET- Low and High Frequency Response of an RC coupled stage,Band width of multistage amplifiers, Concept of gain bandwidth product, Distortion in Amplifiers.

UNIT3: Feedback Amplifiers **(10 Hrs)**

Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifierCharacteristics. Four Feedback Amplifier Topologies.Method of Analysis ofVoltage Series, Current Series, Voltage Shunt and Current Shunt feedbackAmplifiers.

UNIT 4: Tuned Amplifiers **(10 Hrs)**

Introduction, Q-Factor, small signal tuned amplifier,capacitance coupled single tuned amplifier, double tuned amplifiers, effect ofcascading single tuned amplifiers on band width, effect of cascading doubletuned amplifiers on band width, staggered tuned amplifiers, stability of tunedamplifiers.

UNIT 5: Sinusoidal Oscillators **(10 Hrs)**

Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and TunedCollector Oscillators – Frequency and amplitude Stability of Oscillators Crystal Oscillators – RC Oscillators -- RC Phase Shift and Wein Bridge Oscillators.

Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata McGraw- Hill, 1972.
2. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.

References

1. Electronic Devices and Circuits – Mottershead
2. Electronic Circuit Analysis and Design – Donald A. Neaman, McGraw Hill.
3. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

SIGNAL AND SYSTEMS

EEE 225 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Course Outcomes:At the end of the course the student will be able to

CO1: Characterize and analyze the properties of CT and DT signals and systems.
CO2: Analyze CT and DT systems in Time domain using convolution.
CO3: Represent CT and DT systems in the Frequency domain using Fourier Analysis tools like CTFS, CTFT, DTFS and DTFT
CO4: Conceptualize the effects of sampling a CT signal.
CO5: Analyze CT and DT systems using Laplace transforms and Z Transforms

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Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	0	3	0	0	2	0	0	0	0	1	3	2
CO2	2	2	0	2	0	0	2	0	0	0	0	1	3	2
CO3	3	2	0	3	0	0	2	0	0	0	0	1	2	2
CO4	1	2	0	1	0	0	0	0	0	0	0	1	1	-
CO5	1	3	0	3	0	0	2	0	0	0	0	1	2	2

SYLLABUS

UNIT-I Signals and systems: **(12 periods)**

Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, random signals, CT systems and DT systems, Basic properties of systems .

UNIT-II Linear Time Invariant Systems: **(12 periods)**

Discrete Time Linear Time Invariant Systems, Convolution Sum , Continuous Time Linear Time Invariant Systems, Convolution Integral ,properties of LTI systems , LTI systems described by linear constant coefficient differential and difference equations.

UNIT-III -Analysis of CT Signals: **(12 periods)**

Fourier series analysis – Spectrum of CT signals – Fourier transform and Laplace transform in signal analysis, Differential equation – Block diagram representation – Impulse response – Convolution integral – Frequency response – Fourier transform and Laplace transform in analysis.

UNIT-IV- Analysis of DT Signals: **(12 periods)**

Spectrum of DT signals – Discrete Time Fourier Transform (DTFT),Discrete Fourier Transform (DFT),Z-transform and its Properties in signal analysis, Inverse Z-Transforms, Difference equations – Block diagram representation – Impulse response – convolution SUM – Frequency response - Fourier transform and Laplace transform in analysis.

UNIT-V Sampling: **(12 periods)**

Sampling Theorem: Representation of continuous time signals by its sample - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals using Fourier's Transform, sampling of band pass signals.

Text Books:

1. A.V.Oppenheim, A.S.Willsky and S.H.Nawab -Signals & Systems, Pearson .[UNIT-1,UNIT-2,UNIT-5]
2. S.Haykin&B.V.Veen, Signals and Systems- John Wiley. [UNIT-3,UNIT-4]

References:

1. J.G.Proakis&D.G.Manolakis- Digital Signal Processing Principles, Algorithms andApplications, PHI.
2. A.NagoorKani- Signals and Systems- McGraw Hill
3. E WKamen&BS Heck- Fundamentals of Signals and Systems Using the Web and Matlab- Pearson.
4. RajeswariK.Raja, RaoB.Visvesvara -Signals and systems , PHI.

MICROPROCESSORS AND MICRO CONTROLLERS

EEE 226 **Credits: 3**
Instruction: 3 periods & 1 Tut / Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Course Outcomes: At the end of the course the student will be able to:

CO	BL	CO Statement
CO1	BL-2	**Describe** the architecture and various addressing modes of a typical 8085 microprocessor.
CO2	BL-4	**Classify** different Memory devices to **Discuss** the interfacing between memory and 8085 microprocessor
CO3	BL-3	**Describe** the architecture of a typical 8086 microprocessor to **Illustrate** general bus operations.
CO4	BL-3	**Describe** the various peripheral devices and **Show** how the peripherals (8259, 8251 & 8253) are interfaced with Microprocessor.
CO5	BL-4	**Use** the architecture of 8051 microcontroller and **Illustrate** how 8051 is interfaced with advanced applications.

Program Matrix

COs	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	1	-	1
CO2	2	2	1	-	2	-	-	-	-	-	-	1	-	1
CO3	2	2	1	-	-	-	-	-	-	-	-	1	-	1
CO4	2	1	1	-	-	-	-	-	-	-	-	1	-	1
CO5	2	1	1	-	-	-	-	-	-	-	-	1	-	1

JUSTIFICATION STATEMENT FOR CO-PO MAPPING			
COs	**POs**	**Level**	**Description**
CO1	PO1	2	Microprocessor 8085 architecture and operations (arithmetic binary operations) are illustrated with the knowledge of basic engineering sciences like digital electronics and mathematics.
CO1	PO2	2	Based on the mnemonics and register knowledge of 8085, opcodes are formulated and analyze the instructions of different bytes.
CO1	PO12	1	Recognize the need of 8085 architecture and instruction sets, in order to be compatible enough for microprocessor programming, utilized in research and industrial applications.
CO1	PSO2	1	With the knowledge of programming basics in 8085, as per the requirement and availability, their application to control drives are analyzed.
CO2	PO1	2	The fundamental knowledge of basic engineering mathematics, engineering physics and electronics engineering is utilized for illustrating individual memory structures.
CO2	PO2	2	Based on the knowledge of memory IC configuration, allocation of address lines are formulated and their connection with processor is analyzed.

CO2	PO3	1	The classification and configuration knowledge of memory ICs are utilized for designing interfacing circuits with processors.
CO2	PO5	2	Using MATLAB/SIMULINK software memory devices in the form of circuits are designed and analyzed.
CO2	PO12	1	Recognize the need of memory classification and interfacing, as memory device play a major role in every processor based research and industrial application.
CO2	PSO2	1	With the knowledge of memory interfacing, as per the requirement and availability, their application with processor in control and drives are analyzed.
CO3	PO1	2	Microprocessor 8086 architecture, organization and operations are demonstrated with the knowledge of basic engineering sciences like digital electronics and mathematics.
CO3	PO2	2	Based on the mnemonics and register knowledge of 8086, opcodes are formulated and instructions of different bytes are analyzed.
CO3	PO3	1	The formulation of address bus allocation in 8086 is utilized for designing interfacing systems of 8086 with odd and even memory banks.
CO3	PO12	1	Recognize the need of 8086 architecture and instruction sets, in order to be compatible enough for programming, utilized in research and industrial applications.
CO3	PSO2	1	With the knowledge of programming basics in 8086, as per the requirement and availability, their application to control drives are analyzed.
CO4	PO1	2	The fundamental knowledge of basic engineering mathematics, engineering physics and electrical engineering is utilized for illustrating interfacing devices and ICs like stepper motor, keyboard/display ICs, etc.
CO4	PO2	1	Based on the knowledge of interfacing IC devices, allocation of address lines are formulated and their connection with processor is analyzed.
CO4	PO3	1	The configuration knowledge of interfacing devices and ICs such as stepper motor are utilized for designing their interfacing with processors, as per the application and requirement.
CO4	PO12	1	Recognize the need of interfacing auxiliary devices and ICs with processors, as it is commonly employed in research and industrial application.
CO4	PSO2	1	With the knowledge of specific application based IC interfacing, as per the requirement and availability, their control design with processor and drives are analyzed.
CO5	PO1	2	Microcontroller 8051 architecture, organization and operations are demonstrated with the knowledge of basic engineering sciences like digital electronics and mathematics.
CO5	PO2	1	Based on the register knowledge of 8051, opcodes are formulated and instructions of different bytes are analyzed.
CO5	PO3	1	The formulation of port allocation in 8051 is utilized for designing interfacing systems of 8051 with memory and interfacing devices.
CO5	PO12	1	Recognize the need of 8051 architecture and port identification, in order to be compatible enough for programming, utilized in research and industrial applications.
CO5	PSO2	1	With the knowledge of programming basics in 8051, as per the requirement and availability, their application to control drives are analyzed.

SYLLABUS

UNIT-I: **(14 periods)**

INTRODUCTION TO MICROPROCESSOR ARCHITECTURE(8085): Introduction, internal architecture and functional description of 8085 processor-instruction set and timing diagrams.

UNIT-II : **(08 periods)**

MEMORIES: RAM, ROM, PROM, static and dynamic memories-memory addressing-interfacing memory to cpu.

UNIT-III: **(12 periods)**

INTRODUCTION TO MICROPROCESSOR ARCHITECTURE (8086):

Introduction and evolution of microprocessorarchitecture of 8086, register organization of 8086, memory organization of 8086, general bus operation of 8086.

UNIT-IV: **(12 periods)**

INTERFACING WITH ADVANCED DEVICES:

Stepper motor interfacing, key board/display device: 8279 block diagram and its operation, 8251 (USART), block diagram and functions of each block, timer-8253 block diagram and modes of operation.

UNIT-V: **(14 periods)**

INTERFACING AND INDUSTRIAL APPLICATIONS OF 8051:

Applications of micro controllers, interfacing 8051 to led's, push button, relay's and latch connections, keyboard interfacing, interfacing seven segment display, adc and dac interfacing.

TEXT BOOKS:

1. Microprocessors and Interfacing, Douglas V Hall, Mc-Graw Hill, 2nd Edition.
2. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", Thomson Publishers, 2nd Edition.
3. R.S. GAONKAR: Processor Architecture, Programming and ApplicationsWithThe8085/8080A,WileyEasternLtd.

REFERENCE BOOKS:

1. R.S. Kaler, " A Text book of Microprocessors and Micro Controllers", I.K. International Publishing House Pvt. Ltd.
2. Ajay V. Deshmukh, "Microcontrollers – Theory and Applications", Tata McGraw-Hill Companies –2005.

ELECTRICAL MEASUREMENTS LAB

EEE 227 **Credits: 2**

Instruction: 3 periods / Week Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: 50

Contribution to Outcomes:

At the end of the course the student will be able to:

COs	BLs	CO Statement
CO1	BL-4	**Analyze** the measurement of power with the help of Voltmeter, Ammeter and Wattmeter to **Determine** active and reactivepower for the given AC circuit.
CO2	BL-4	**Calibrate** the Wattmeter and energy meter to **Evaluate** the error of the given load
CO3	BL-4	**Design** different AC and DC bridges to**Determine** an unknown resistance, Inductance, Capacitance, frequency in ac circuits and unknown voltage

Program Matrix

	Program Outcomes (POs)												PSOs	
	Domain Specific POs					Domain Independent POs								
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		3			0	0	2	2	0	1		
CO2	3	2		3			0	0	2	2	0	1		
CO3	3	2	1	3			0	0	2	2	0	1		

S.No	Name of the Experiment	CO's
1	Calibration and testing of single phase Energy Meter.	CO2
2	Calibration of Single phase Energy Meter by using Phantom Loading.	CO2
3	Calibration of Dynamometer type wattmeter by using Direct Loading (through CTs or PTs).	CO2
4	Measurement of 3 phase power by using two wattmeter method.	CO1
5	Calibration of Dynamometer type wattmeter by using Phantom Loading.	CO2
6	Calibration of Dynamometer type Power Factor meter.	CO2
7	Measurement of 3 Phase Reactive Power by using single wattmeter.	CO1
8	Measurement of Inductance by using Anderson's bridge.	CO3
9	Measurement of Inductance by using Maxwell's Inductance-Capacitance bridge.	CO3
10	Measurement of Inductance by using Kelvin's Double bridge.	CO3
11	Measurement of Capacitance by using Schering bridge.	CO3
12	Measurement of Capacitance by using Desaugty's bridge.	CO3
13	Measurement of power by using 3 ammeter and 3 voltmeter method.	CO1
14	Finding the parameters of a choke coil	CO1

ANALOG ELECTRONIC CIRCUITS LAB

EEE 228 **Credits: 2**
Instruction: 3 periods / Week Sessional Marks: 50
End Exam: 3 Hours End Exam Marks: 50

COURSE OUTCOMES: At the end of the course the student will be able to

CO1: Acquire a basic knowledge in solid state electronics including voltage transistor, power transistors and operational amplifier.
CO2: Design analog electronic circuits using discrete components.
CO3: Observe the amplitude and frequency responses of common amplification circuits.
CO4: Measure various parameters of analog circuits and compare experimental results in the laboratory with theoretical analysis.
CO5: Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers, oscillators.

Mapping of course outcomes with program outcomes:

COs	**Program Outcomes (POs)**												**PSOs**	
	Domain Specific POs					**Domain Independent POs**								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	0	3	2	0	0	2	2	0	0	0	1	2	1
CO2	0	2	3	2	0	0	2	0	0	0	0	1	2	1
CO3	0	0	0	3	0	0	0	2	1	0	0	1	2	1
CO4	0	0	0	3	0	0	0	0	2	0	0	1	1	-
CO5	0	3	3	0	0	0	0	2	0	0	0	1	3	1

LIST OF EXPERIMENTS

1. Design of CE amplifier and obtain its frequency response.
2. Design of CC amplifier and obtain its frequency response.
3. Frequency response of two stage-RC coupled amplifier.
4. Frequency response of Common source FET amplifier.
5. Current series feedback amplifier.
6. Voltage shunt feedback amplifier.
7. Hartley oscillator.
8. Colpitt's oscillator.
9. RC Phase - Shift Oscillator.
10. Wein - Bridge Oscillator.
11. Tuned Voltage Amplifier.