B.Tech.
in
ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)

Scheme of Instruction, Examination and Syllabi
of
III and IV Semesters

Academic Year: 2022-23

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
Affiliated to JNTUH; Accredited by NAAC with 'A' Grade; 6 U.G. Programs
Accredited by NBA
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MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.Tech. in Electrical and Electronics Engineering

Scheme of Instruction and Examination

III Semester

S.No.	Course Code	Course Title	Instruction			Examination			Credits
			Hours per week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	ME331ES	Engineering Mechanics	3	1	0	30	70	3	4
2	EE301PC	Electrical Circuit Analysis	3	1	0	30	70	3	4
3	EE302PC	Electrical Machines – I	3	0	0	30	70	3	3
4	EE303PC	Electromagnetic Fields	3	0	0	30	70	3	3
5	EC332PC	Analog Electronics	3	0	0	30	70	3	3
6	MC301HS	Constitution of India	3	0	0	30	70	3	0
7	EE351PC	Electrical Circuits Lab	0	0	2	30	70	3	1
8	EE352PC	Electrical Machines Lab – I	0	0	2	30	70	3	1
9	EC362PC	Analog Electronics Lab	0	0	2	30	70	3	1
10	EN351HS	Finishing School – I	0	0	2	30	70	3	1
Total Hours/Marks/Credits			**18**	**2**	**8**	**300**	**700**	--	**21**

L: Lecture **T**: Tutorial **D**: Drawing **P**: Practical
CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

L	T	P	C
3	1	0	4

III Semester Syllabus
ME331ES: Engineering Mechanics

Course Objectives

At the end of this course, students are expected to
- Explain the resolution of forces, compute the resultant of system of forces, solve problems using equations of equilibrium and analyze trusses.
- Perform analysis of bodies involving friction and power transmissions by belts.
- Locate the centroid and compute the area moment of inertia of standard and composite sections
- Locate centre of gravity and compute the mass moment of inertia of standard and composite bodies.
- Explain kinematics and kinetics of bodies in translation and rigid body rotation.

Course Outcomes

After successful completion of the course, students should be able to
- Analyze equilibrium of bodies and trusses subjected to system of forces.
- Solve problems involving friction and power transmission by belts.
- Find the location of centroid and calculate the area moment of inertia of a given section.
- Calculate the centre of gravity and the mass moment of inertia of given body.
- Apply equations of kinematics and principles of kinetics to solve problems on translations and rigid body rotation.

Unit- I

Introduction to Engineering Mechanics - Basic concepts, System of Forces, Moment of Forces and its Application; Resultant of Force System, Free body diagrams, Equilibrium of System of Forces, Equations of Equilibrium of Coplanar Concurrent Force System; Spatial Systems - Components in Space, Resultant; Analysis of Trusses, Static Indeterminacy.

Unit-II

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Belt friction and Power transmission.

Unit-III

Centroid of Lines and Areas from first principles; Centroid of composite sections;
Centre of Gravity of simple bodies and composite bodies; Theorems of Pappus.

Unit- IV

Moment of Inertia – Definition; Theorems of moment of inertia; Area Moment of inertia of plane sections from first principles, Area Moment of inertia of composite sections;

Mass Moment of Inertia - Transfer Formula, Mass moment of inertia of simple bodies and composite bodies.

Unit-V

Kinematics – Translation and fixed axis rotation

Kinetics – Introduction to work, energy and power for translation and fixed axis rotation; Conservation of momentum and impulse-momentum principle; applications of D'Alembert's principle and Work-Energy principle in translation and fixed axis rotation.

Suggested Readings:

1. K.Vijay Kumar Reddy and J.Suresh Kumar, Singer's Engineering Mechanics – Statics and Dynamics, BS Publications, 2011.
2. Irving H. Shames and G. Krishna Mohan Rao, Engineering Mechanics, Pearson Education, 2005.

Reference Books:

1. Timoshenko S.P and Young D.H., Engineering Mechanics, Mc Graw Hill International Edition, 1983.
2. Beer F.P & Johnston E.R Jr. Vector, Mechanics for Engineers, Tata McGraw Hill, 2004.
3. Hibbeler R.C & Ashok Gupta, Engineering Mechanics, Pearson Education, 2010.
4. Tayal A.K., Engineering Mechanics – Statics & Dynamics, Umesh Publications, 2011.
5. Basudeb Bhattacharyya, Engineering Mechanics, Oxford University Press, 2008.
6. Nelson A, Engineering Mechanics - Statics and Dynamics, McGraw Hill Education, 2017.

L	T	P	C
3	1	0	4

III Semester Syllabus
EE301PC: Electrical Circuit Analysis

Prerequisites: Basic Electrical Engineering

Course Objectives

- To apply network theorems to analyze electrical circuits
- To understand Magnetic Circuits and Three phase circuits
- To analyze transients in Electrical systems
- To evaluate Network parameters of given Electrical network

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Apply network theorems for the analysis of electrical circuits
- Obtain the transient and steady-state response of electrical circuits
- Analyze circuits in the sinusoidal steady-state (single-phase and three-phase)
- Analyze two port circuit behaviour

Unit – I: Network Theorems

Mesh and Nodal Analysis in DC and AC Circuits. Analysis with dependent current and voltage sources. Superposition theorem using DC excitation, Superposition theorem using AC excitation Thevenin's theorem using DC excitation, Thevenin's theorem using AC excitation, Norton's theorem using DC excitation, Norton's theorem using AC excitation, Maximum power transfer theorem using DC excitation, Maximum power transfer theorem using AC excitation, Reciprocity theorem using DC excitation, Reciprocity theorem using AC excitation, Compensation theorem using DC excitation, Compensation theorem using AC excitation, Milliman's theorem using DC excitation, Milliman's theorem using AC excitation. Dual Networks for DC and AC sources

Unit – II: AC Circuit Analysis

Representation of sine function as rotating phasor. Effective or RMS values, for different types of wave forms, R, L, C elements. Phasor representation of Impedance and Admittance of series and parallel R-L, R-C, R-L-C circuits. Average power; complex power. **Series R-L-C Resonance**: Resonance frequency, band width, quality factor, selectivity. **Parallel R-L-C Resonance**: Resonance frequency, band width, quality factor, selectivity. Current Locus diagrams of R-L and R-C circuits

Unit – III: Magnetic Circuits and Three Phase Circuits

Magnetic circuits: Series and Parallel magnetic circuits. Self induced EMF, self inductance, mutual induced EMF, mutual inductance coefficient of coupling. Dot convention in coupled circuits.

Three-phase circuits: Star connected load, delta connected load. Measurement of three phase power by two wattmeter method.

Unit – IV: Analysis of response of R-L-C Circuits

Transient state response and Steady state response for DC Excitation, Transient state response and Steady state response for AC Excitation, with initial and final conditions, Time constants, forced response and free response.

Solution of first order differential equations for Series R-L circuit, Solution of first order differential equations for Series R-C circuit, Solution of Second order differential equations for Series R-L-C circuit. Solution of first order differential equations for Parallel R-L circuit, Solution of first order differential equations for Parallel R-C circuit, Solution of Second order differential equations for Parallel R-L-C circuit.

Unit – V: Two Port Networks and Network Functions

Impedance parameters, admittance parameters, transmission parameters, inverse ABCD parameters, hybrid parameters, g-parameters, Reciprocity condition and Symmetry conditions. Relation between the parameters.

Interconnections of two port networks: Series interconnection, parallel inter connection, series and parallel interconnection, parallel and series interconnection, cascade interconnection.

Suggested Readings:

1. Abhijit Chakrabarti, “Circuit Theory : Analysis and Synthesis”, Dhanpat Rai & Co
2. N C Jagan, C Lakshmi Narayana, “Electrical Circuit Analysis” B S Publications
3. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.

Reference Books:

1. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, Mc Graw Hill Education, 2013.
2. Ravish R Singh, “Network Analysis and Synthesis”, Mc Graw Hill.
3. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
4. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, Mc Graw Hill Education, 2004.
5. K. V. V. Murthy and M.S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.

L	T	P	C
3	0	0	3

III Semester Syllabus
EE302PC: Electrical Machines – I

Prerequisites: Basic Electrical Engineering

Course Objectives

- To study and understand different types of DC Generators - their construction, operation, and applications
- To study and understand different types of DC Motors - their construction, operation, and applications
- To study and understand different types of Transformers - their construction, operation, and applications
- To analyze performance aspects and various testing methods of DC Generators, Motors and Transformers

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Identify different parts of a DC machine & understand it's operation
- Carry out different testing methods to predetermine the efficiency of DC machines
- Understand different excitation and starting methods of DC machines
- Control the voltage and speed of DC machines
- Analyze single phase and three phase Transformers

Unit – I: D.C. Generators

Principle of operation – constructional features - Action of commutator — armature windings terms – Types of armature windings – Applications of lap and wave windings, simplex and multiplex windings, Dummy coils, Equalizer rings, – use of laminated armature – E.M.F Equation, problems on E.M.F Equation, Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation, problems. Methods of Excitation – Types of DC generators - separately excited and self-excited generators, Applications of DC generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure to self-excite and remedial measures. Load characteristics of shunt, series and compound generators.

Unit – II: D.C. Motors

Principle of operation, Working of DC Motor, Back or counter E.M.F., Significance of back E.M.F, voltage equation of Motor, Power equation, Speed equation, condition for maximum power, Armature Torque equation, shaft torque, Types of DC Motors, characteristics and application of shunt, series and compound motors, Applications of DC Motors, Problems, Armature reaction in DC motors, Speed control of D.C. Motors - Armature voltage, field flux control method and Ward Leonard method of speed control method, Problems, Necessity of starter for DC motor, Types of starters - 3-point and 4-point starters, Construction of 3-point starter, Over load and no-volt protection , Power stages, Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency.

Unit – III: Testing of DC Machines

Introduction, Estimation of Efficiency, Methods of testing – direct, indirect, and regenerative testing – Efficiency by Brake test, Advantages and disadvantages of Brake Test, Problems on Brake Test, Efficiency by Swinburne's test – Advantages and disadvantages of Brake Test, Problems on Swinburne's test, Efficiency by Hopkinson's test – assuming both the machines have same efficiency, assuming Iron, friction and windage losses are same in both the machines, Advantages of Hopkinson's Test, Problems on Hopkinson's Test, Field's test on DC series machines, Problems on series field test, separation of stray losses in a DC motor test, Problems on separation of losses.

Unit – IV: Single Phase Transformers

Principle of operation of 1-phase transformer, Types of 1-phase transformers - constructional details, ideal transformer, Voltage Transformation ratio, Current ratio, Losses in 1-phase transformers, minimization of hysteresis and eddy current losses- EMF equation, Problems operation of transformer on No-load - phasor diagrams of transformer on No-load, Transformer on Load, Phasor Diagram of transformer with Resistive, Inductive and capacitive load with and without drops, Impedance Ratio, Equivalent circuit – Transferring equivalent circuit parameters, simplification of Equivalent circuit, efficiency of transformer, Condition for maximum efficiency, Voltage regulation of transformer - All day efficiency, Problem on efficiency and regulation of transformer.

Unit – V: Testing of Transformers and Poly-Phase Transformers

Transformer Tests – Open circuit and Short Circuit Tests, Determination of efficiency, determination of equivalent circuit parameters, advantages of OC and SC Tests, Problems on OC and SC Tests, Sumpner's test - predetermination of efficiency, problems on Sumpner's test, separation of losses in 1-phase transformer, Conditions for parallel operation of transformers, parallel operation of 1-phase transformers with equal and unequal voltage ratios, problems on parallel operation of transformer, auto transformers-equivalent circuit – output power, saving of copper in auto transformer, advantages and disadvantages of auto transformer, applications, comparison with two winding

transformers. Problems on auto transformers, Introduction to Poly-phase transformers – Poly-phase connections - Y/Y, Y/ Δ, Δ/Y, Δ / Δ and open Δ.

Suggested Readings:

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
2. J. B. Gupta, “Theory and Performance of Electrical Machines”, S. K. Kataria and Sons.
3. I. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.
4. V. K. Mehta, Rohit Mehta, “Principles of Electrical Machines”, S. Chand and Co Ltd, Second Edition.

Reference Books:

1. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
2. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
3. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.

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III Semester Syllabus
EE303PC: Electromagnetic Fields

Prerequisites: Nil

Course Objectives

- To introduce the concepts of electric field and magnetic field
- Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Understand the basic laws of electromagnetism
- Obtain the electric and magnetic fields for simple configurations under static conditions
- Analyze time varying electric and magnetic fields
- Understand Maxwell's equations in different forms and different media

Unit-I: Static Electric Field

Review of conversion of a vector from one coordinate system to another coordinate system, Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations, potential gradient. Electric dipole, Dipole moment, Polarization Potential due to an Electric Dipole.

Unit-II: Conductors, Dielectrics and Capacitance

Current and current density, Ohms Law in Point form, Continuity equation, Boundary conditions of conductors and dielectric materials. Capacitance, Capacitance of a two-wire line, Electrostatic Energy and Energy density in a static electric field. Conduction current density and Convection current density. Poisson's and Laplace's equation, Solution of Laplace equation.

Unit-III: Static Fields

Biot-Savart Law, Ampere's Circuital Law and it's applications. Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.

Unit-IV: Magnetic Forces

Lorentz force equation. Force on a moving charge, Force on a differential current element, Force between differential current elements, Magnetic boundary conditions. Behaviour of magnetic materials, magnetic energy, magnetic forces in uniform magnetic fields.

Unit-V: Time Varying Fields and Maxwell's Equations

Self and Mutual inductance. Determination of self-inductance of a solenoid and toroid. Faraday's law of Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive force, Maxwell's equation in Phasor form, Poynting theorem.

Suggested Readings:

1. K. A. Gangadhar, "Electromagnetic Field Theory", Khanna Publishers
2. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.

Reference Books:

1. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.
2. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
3. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.

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III Semester Syllabus
EC332PC: Analog Electronics

Course Objectives

- To introduce components such as diodes, BJTs, FETs & MOSFETs their switching characteristics, applications.
- Learn the concepts of low frequency analysis of transistors.
- To give understanding of various types of amplifiers such as feedback amplifier circuits, oscillator circuits and large signal amplifiers.
- To introduce the basic building blocks of linear integrated circuits (op-amp), applications and the concepts of waveform generation.

Course Outcomes

Upon completing this course, the student will be able to

- Know the characteristics, biasing techniques and utilization of various components.
- Design and analyze various diode applications like rectifiers, clippers and clampers, small signal amplifier circuits.
- Design & analysis of power amplifiers, feedback amplifiers and oscillator circuits.
- A thorough understanding, functioning of OP-AMP, design, OP-AMP based circuits with linear integrated circuits.

Unit – I: Diode Circuits

P-N junction diode, I-V characteristics of a diode, review of rectifiers, clamping and clipping circuits, Input output characteristics of BJT in CB, CE, CC configurations, biasing circuits, Load line analysis, common-emitter, common-base and common collector amplifiers and small signal equivalent circuits.

Unit – II: MOSFET Circuits

Review of FET, MOSFET structure and I-V characteristics, MOSFET as a switch, small signal equivalent circuits - gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, transconductance, high frequency equivalent circuit.

Unit – III: Multi-Stage and Power Amplifiers

Direct coupled and RC Coupled multi-stage amplifiers, Differential Amplifiers, Power amplifiers - Class A, Class B, Class C.

Unit – IV: Feedback Amplifiers

Concepts of feedback, Classification of feedback amplifiers, General characteristics of Negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations, Simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators – Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

Unit – V: Operational Amplifiers

Ideal op-amp, AC and DC characteristics, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, Integrator, Square-wave and triangular-wave generators.

Suggested Readings:

1. Jacob Millman, Christos C Halkias, Integrated Electronics, McGraw Hill Education, 2nd edition 2010
2. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, PHI, 2003.

Reference Books:

1. Thomas L. Floyd, Electronic Devices Conventional and current version - 2015, Pearson.
2. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
3. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, 2001.

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III Semester Syllabus
MC301HS: Constitution of India
(Common to CE, EEE, ME, ECE, MCT & MME)

Course Objectives

- Students will get to know about the history of Indian Constitution.
- Students will get to know about President Election and his Power.
- Students will get to know about Council of Ministers and their election procedure and their powers and responsibilities.
- Students will get know about Judicial System in India.
- Students will get know about Panchayat-raj System in India.

Course Outcomes

- This enables the Students to know about the Rights of Citizen.
- This enables the Students to know about Fundamental Duties of People.
- This enables the Students to Know the Directive principles of State Policy.
- This enables the Students to know about Functioning of Parliament and its Powers.
- This enables the Students to know about various Constitutional bodies in India.

Course content

1. Meaning of the constitution, law and constitutionalism
2. Historical perspective of the Constitution of India
   - Drafting Committee
3. Salient features and characteristics of the Constitution of India
   - Preamble
   - Salient Features
   - Major Sources of Indian Constitution
4. Scheme of the fundamental rights
   - Article 13 to 32
   - Scheme of the Fundamental Right to Equality
   - Scheme of the Fundamental Right to certain Freedom
   - Scope of the Right to Life and Personal Liberty
5. The scheme of the Fundamental Duties and its legal status
   - List of Fundamental Duties
   - Justifiability of Fundamental Duties
6. The Directive Principles of State Policy – Its importance and implementation
   - Categories - Gandhian, Socialist and Liberal Principles

- Significance of Directive Principles of State Policy
- Relation between Fundamental rights and Directive Principles of State Policy

7. Federal structure and distribution of legislative and financial powers between the Union and the States
   - Union List
   - State List
   - Concurrent List
   - Residuary Powers
8. Parliamentary Form of Government in India.
9. The constitutional powers and status of the President of India vs the constitutional powers and status of the Council of ministers headed by the Prime Minister
10. Amendment of the Constitution and its Procedure
    - Procedure of Amendment to Constitution of India
    - Important Amendments
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
    - Urban local Self Government
    - Rural local Self Government
13. Important Constitutional Bodies
    - Election Commission of India
    - Finance Commission of India
    - Union Public Service Commission
    - C-AG

Suggested Readings:

1. Subhash Kashyap, Our Constitution, National Book Trust, 5th Edition, Reprint- 2017.
2. V. N Shukla, The Constitution of India, Law literature Publication, 11th Edition, 2020.

Reference Books:

1. M P Jain, Indian Constitutional Law, Lexis Nexis, 8th Edition, 2018.
2. Samar Aditya Pal, Indian Constitution-Origin& Evolution, Lexis Nexis, 1st Edition, 2019.

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III Semester Syllabus
EE351PC: Electrical Circuits Lab

Prerequisites: Basic Electrical Engineering, Electrical Circuit Analysis

Course Objectives

- To design electrical systems
- To analyze a given network by applying various Network Theorems
- To measure three phase Active and Reactive power
- To understand the locus diagrams

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Analyze complex DC and AC linear circuits
- Apply concepts of electrical circuits across engineering
- Evaluate response in a given network by using theorems

The following experiments are required to be conducted as compulsory experiments

1. Verification of Thevenin's, Norton's and Maximum Power Transfer theorems
2. Verification of Superposition and Reciprocity Theorems
3. Locus Diagrams of R-L and R-C Series Circuits
4. Series and Parallel Resonance
5. Time response of first order R-L / R-C network for periodic non–sinusoidal inputs–Time constant and Steady state error determination.
6. Two port network parameters–Z & Y parameters, Analytical verification.
7. Two port network parameters–A B C D & Hybrid parameters, Analytical verification
8. Separation of Self and Mutual inductance in a Coupled Circuit. Determination of Coefficient of Coupling.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted

9. Verification of Compensation & Milliman's theorems
10. Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyzer and plotting frequency spectrum.
11. Determination of Form factor for non-sinusoidal waveform
12. Measurement of Active Power for Star and Delta connected balanced loads
13. Measurement of Reactive Power for Star and Delta connected balanced loads

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III Semester Syllabus
EE352PC: Electrical Machines Lab–I

Prerequisites: Electrical Machines-I

Course Objectives

- To expose the students to the operation of DC Generator
- To expose the students to the operation of DC Motor
- To examine the self-excitation in DC generators

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Start and control the Different DC Machines
- Assess the performance of different machines using different testing methods
- Identify different conditions required to be satisfied for self-excitation of DC Generators
- Separate iron losses of DC machines into different components

The following experiments are required to be conducted as compulsory experiments:

1. Magnetization characteristics of DC shunt generator (Determination of critical field resistance and critical speed)
2. Load test on DC shunt generator (Determination of characteristics)
3. Load test on DC series generator (Determination of characteristics)
4. Load test on DC compound generator (Determination of characteristics)
5. Hopkinson's test on DC shunt machines (Predetermination of efficiency)
6. Fields test on DC series machines (Determination of efficiency)
7. Swinburne's test and speed control of DC shunt motor (Predetermination of efficiencies)
8. Brake test on DC compound motor (Determination of performance curves **In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:**
9. Brake test on DC shunt motor (Determination of performance curves)
10. Retardation test on DC shunt motor (Determination of losses at rated speed)
11. Separation of losses in DC shunt motor.

L	T	P	C
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III Semester Syllabus
EC362PC: Analog Electronics Lab

Prerequisite: Analog Electronics

Course Objectives

- To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
- To give understanding of various types of BJT and FET amplifiers.
- To give understanding of various types of feedback amplifier circuits, Oscillators and large signal amplifier circuits.
- To introduce the Op-Amp IC, inverting and non-inverting amplifiers characteristics and applications.

Course Outcomes

Upon completing this course, the student will be able to

- Know the characteristics, utilization of various components.
- Design and analyze various rectifiers, small signal amplifier circuits.
- Design and analyze various feedback amplifiers, Oscillators and large signal Amplifier circuits.
- A thorough understanding, functioning of OP-AMP, designs OP-AMP based circuits with linear integrated circuits.

List of Experiments (Ten experiments to be done):

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Full Wave Rectifier with & without filters
3. Input and Output characteristics of BJT in CE Configuration
4. Common Emitter Amplifier
5. Common Base Amplifier
6. Common Source amplifier
7. Inverting and Non-inverting Amplifiers using Op Amps.
8. Adder and Subtractor using Op Amp.
9. Integrator Circuit using IC 741.
10. Differentiator circuit using Op Amp.
11. Current Shunt Feedback amplifier
12. RC Phase shift Oscillator
13. Hartley and Colpitt's Oscillators
14. Class A power amplifier

Major Equipment required for Laboratories:

1. Regulated Power Suppliers, 0-30V.
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals.
4. Multimeters.
5. Electronic Components.

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III Semester Syllabus
EN351HS: Finishing School-I
(Common to all Branches)

Course Overview

In view of the growing importance of English as a tool for global Communication and the consequent emphasis on training students to acquire language skills, this syllabus has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

Course Objectives

The main objective of this finishing school curriculum is to provide content for developing the LSRW skills of language learning and to facilitate proficiency in both receptive and productive skills, among students.

Methodology:

- Every Session will have activities on all the four skills-Listening, Speaking, Reading and Writing.
- To personalize the learning a variety of case studies and structured problem solving activities will be given to small groups and the teachers will facilitate peer reviews.
- Continuous grading, peer review and positive reinforcement will be emphasized
- Vocabulary exercises will also be a part of every session
- All sessions are designed to be student-centric and interactive.

Unit-I: Fundamentals of Communication

Unit Overview:

This is an introductory module that covers the fundamentals of communication. This module is intended to enable the students to communicate using greetings and small sentences/queries.

Learning Outcomes:

The students should be able to:

- Respond to questions
- Engage in informal conversations.
- Speak appropriately in formal situations
- Write formal and informal emails/letters

Competencies:

- Greeting appropriately
- Introducing themselves, a friend
- Situational Dialogue writing

- Responding to simple statements and questions both verbally and in writing
- Writing an email with appropriate salutation, subject lines, introduction and purpose of mail.
- Using appropriate vocabulary for both formal and informal situations.
- JAM sessions.

Sessions:

1. Introduction to Formal and Informal Conversations (Listening Activity)
2. Informal Conversations
3. Informal Conversations - Writing
4. Formal Conversations
5. Formal Conversations – Writing
6. Grammar-Prepositions
7. Adjectives and Degrees of Comparison
8. Word formation: Prefixes and Suffixes

Unit–II: Rational Recap

Unit Overview:

The module enables the participants to organize their communication, structure their speaking and writing, explain their thoughts/ideas, and summarize the given information.

Learning Outcomes:

The students should be able to:

- Classify content and describe in a coherent form
- Recognize and list the key points in a topic/message/article.
- Compare and contrast using appropriate structure
- Explain cause and effect
- Use appropriate transitions in their presentations and written assignments

Competencies:

- Organizing the communication based on the context and audience
- Structuring the content based on the type of information.
- Explaining a technical/general topic in detail.
- Writing a detailed explanation/process
- Recapitulating

Sessions:

1. Introduction to Mind maps
2. Classification
3. Sequencing
4. Description and Enumeration

Unit-III: Narrations and Dialogues

Unit Overview:

The Module is intended to develop the desired level of language competence that enables them to narrate and participate in casual dialogues.

Learning Outcomes:
The students should be able to
- Narrate a message/story/incident, both verbally and in writing.
- Describe an event/a session/ a movie/ an object / image
- Understand Vocabulary in context

Competencies:
- Framing proper phrases and sentences to describe in context
- Reading Stories and articles and summarizing.
- Speaking fluently with clarity
- Listening for main ideas and reformulating information in his/her own words
- Drawing and writing appropriate conclusions, post reading a passage.
- Speaking Reading and Writing descriptive sentences and paragraphs
- Using appropriate tenses, adjectives and adverbs in conversations and written tasks

Sessions:
Grammar: Verb, Tenses
1. Recalling and Paraphrasing
2. Describing Events
3. Describing Objects/ Places
4. Story Telling
5. Describing Hypothetical events

Unit-IV: Technical Expositions and Discussions

Unit Overview:
The module enables the students to build strategies for effective interaction and help them in developing decisive awareness and personality, maintaining emotional balance.

Learning Outcomes:
The students should be able to:
- Participate in Professional discussions by providing factual information, possible solutions, and examples.

Competencies:
- Comprehending key points of a topic and identifying main points including supporting details.
- Construct a logical chain of arguments and decisive points.
- Writing a review about a product by providing reasons, causes and effects

Sessions:
Based on Case Studies
1. Compare and Contrast
2. Cause and Effect
3. Problem and Solution

Unit-V: Drawing Conclusions

Unit Overview:

This module is intended to provide necessary inputs that enable the students to draw conclusions out of a discussion and provide reports.

Learning Outcomes:

Students should be able to:

- Provide logical conclusions to the topics under discussion.
- Prepare, present, and analyze reports.

Competencies:

- Reasoning skills - Coherent and logical thinking
- Reporting and Analyzing skills.
- Analyzing the points discussed.
- Connecting all points without gaps.
- Connectives
- Communicating the decisions

Sessions:

1. Report Writing
2. Reasoning
3. Analyzing
4. Generalization and Prediction
5. Précis writing

Reference Books:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007.
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007 Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. Mc Murrey & Joanne Buckley. 2012, Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.
10. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition.

IV Semester

S.No.	Course Code	Course Title	Instruction			Examination			Credits
			Hours per week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	MA406BS	Probability Distributions and Transform Calculus (EEE& ECE)	3	1	0	30	70	3	4
2	EE401PC	Electrical Machines – II	3	1	0	30	70	3	4
3	EE402PC	Control Systems	3	0	0	30	70	3	3
4	EE403PC	Power Systems - I	3	0	0	30	70	3	3
5	EC431PC	Digital Electronics	3	0	0	30	70	3	3
6	EE451PC	Electrical Machines Lab – II	0	0	2	30	70	3	1
7	EE452PC	Control Systems Lab	0	0	2	30	70	3	1
8	EC461PC	Digital Electronics Lab	0	0	2	30	70	3	1
9	EN452HS	Finishing School – II	0	0	2	30	70	3	1
10	MC451HS	Gender Sensitization Lab	0	0	2	30	70	3	0
Total Hours/Marks/Credits			**15**	**2**	**10**	**300**	**700**	--	**21**

L: Lecture **T**: Tutorial **D**: Drawing **P**: Practical
CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

L	T	P	C
3	1	0	4

IV Semester Syllabus
MA406BS: Probability Distributions and Transform Calculus
(Common to EEE & ECE)

Course Objectives

To learn
- The ideas of probability, random variables and various probability distributions and their properties. The concept of theoretical distributions.
- The sampling theory and testing of hypothesis and making inferences.
- Understand and Evaluate Laplace Transforms.
- Understand and Evaluate Fourier series.
- The concept of Fourier transforms and Z- Transforms.

Course Outcomes

After learning the contents of this paper the student must be able to
- Formulate and solve problems involving random variables.
- Understand the theoretical distributions.
- Apply statistical methods for analyzing experimental data.
- Application of Laplace Transforms.
- Application of Fourier series, Transforms Z-Transforms.

Unit - I: Probability distributions

Random variables: Discrete and continuous random variables and their distributions functions, Expectation of Random Variables, Variance of random variables.

Binomial and Poisson distributions its properties, Poisson approximation to the binomial distribution. Normal and exponential distributions and its properties. Normal approximation to Binomial distribution.

Unit - II: Testing of Hypothesis

Theory of Estimation; Test of significance- Basics of testing of Hypothesis, Null and Alternate Hypothesis, types of errors, level of significance, critical region; Large sample test -single mean, difference of means, single proportion, difference of proportions; Small sample test- single mean, difference of means.

Unit - III: Laplace Transforms

Laplace Transforms; Laplace Transform of standard functions; first shifting theorem; Laplace transforms of functions when they are multiplied and divided by‘t’. Laplace

transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of special functions; Laplace transform of periodic functions. Inverse Laplace transform and its properties, convolution theorem (without Proof), solving ODEs by Laplace Transform method.

Unit- IV: Fourier series

Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series.

Unit- V: Fourier& Z-Transforms

Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and cosine transforms, properties, inverse transforms, Finite Fourier transforms.
z-transform; Inverse z-transform; Properties, initial, and final value theorems.

Suggested Readings:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications.
3. Integral Transforms- by Vasishtha A.K (Author), Gupta R K (Author).
4. The Use of Integral Transforms Hardcover – January 1, 1972 by Ian N. Sneddon (Author).

Reference Books:

1. Fundamentals of Mathematical Statistics, Khanna Publications, S. C. Gupta and V. K. Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Lokenath Debnath, Dambaru Bhatta, Integral Transforms and Their Applications.

L	T	P	C
3	1	0	4

IV Semester Syllabus
EE401PC: Electrical Machines – II

Prerequisites: Electrical Machines-I

Course Objectives

- To deal with the detailed analysis of poly-phase induction motors & Alternators
- To understand operation, construction and types of single phase motors and their applications in house hold appliances and control systems
- To introduce the concept of parallel operation of alternators
- To introduce the concept of regulation and its calculations

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Understand the concepts of rotating magnetic fields
- Understand the operation of AC machines
- Analyze performance characteristics of AC machines

Unit – I: Three Phase Induction Machines

Constructional details of cage and wound rotor machines- production of a rotating magnetic field – working and principle of operation – synchronous speed, slip and slip speed, effect of slip on rotor EMF and rotor frequency - rotor reactance, rotor current and power factor at standstill and during operation, problems on slip ad rotor parameters.

Unit – II: Characteristics of Induction Machines:

Rotor power input, rotor copper loss and mechanical power developed and their inter relation-expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging. No-load Test and Blocked rotor test –Predetermination of performance- Methods of starting and starting current and Torque calculations. DOL starting method, Y-Δ starting method and auto transformer starting method.

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

Unit – III: Synchronous Machines

Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated E.M.F. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram of alternator

under resistive load, inductive load and capacitive load. Load characteristics. Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of X_d and X_q (Slip test) Phasor diagrams – Regulation of salient pole alternators

Unit – IV: Parallel Operation of Synchronous Machines

Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactances.

Synchronous Motors: Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed - hunting and its suppression – Methods of starting – synchronous induction motor, pony motor and damper winding methods.

Unit – V: Single Phase & Special Machines

Single phase Induction Motor – Constructional features -Double revolving field theory – split-phase motors –resistance split phase induction motors, capacitor start induction run motor and capacitor start capacitor run motor - shaded pole motor.

Suggested Readings:

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

Reference Books:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery”, McGraw Hill Education, 2013.
2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3. A. S. Langsdorf, “Alternating current machines”, McGraw Hill Education, 1984.
4. P. C. Sen, “Principles of Electric Machines and Power Electronics”, John Wiley & Sons, 2007.

L	T	P	C
3	0	0	3

IV Semester Syllabus
EE402PC: Control Systems

Prerequisites: Basic concepts of Electrical Engineering

Course Objectives

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- Understand various compensators to improve system performance

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Understand the modelling of linear-time-invariant systems using transfer function and state-space representations
- Understand the concept of stability and its assessment for linear-time invariant systems.
- Analyze simple controllers

Unit – I: Introduction to Control Problem:

Industrial Control examples. Classification of control systems, Open loop systems, closed loop systems, open loop versus closed loop systems, linear versus non-linear control systems, time varying versus time invariant systems, continuous data versus discrete data systems control systems. Feedback and its effects, effect of feedback on gain, effect of feedback on stability, effect of feedback on noise and external disturbance, effect of feedback on sensitivity. Mathematical models of physical systems – Translational and rotational systems, electrical systems. Control hardware and their models – DC Servo Motor, AC Servo Motor, Synchro Pair. Transfer function models of linear time-invariant systems. Block diagram algebra. Signal flow graph – Masons Gain formula.

Unit – II: Time Response Analysis of Standard Test Signals

Test signals – Step, Ramp, Parabolic, Impulse, Gate, Signum signals. Transient response and Steady State response. Time response of first order systems. Time response of second order systems for standard test inputs. Rise time, Peak time, Settling time, Maximum Peak overshoot of a second order system to step response. Steady state error coefficients. Type and Order of control systems. Application of initial and final value theorem. Design

specifications for second-order systems based on the time-response. Concept of Stability. Effect of adding poles and zeros to the transfer function. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci. Effect of adding poles and zeros to G(s)H(s) on the root locus

Unit – III: Frequency-Response Analysis

Relationship between time and frequency response. Second order systems and Higher order systems. Polar plots and inverse polar plots. Bode plots – Basic factors of $G(j\omega)$ $H(j\omega)$. General rules for constructing bode plots. All Pass and Minimum Phase systems – Correlation between Phase margin and Damping ratio. Computation of Gain Margin and Phase Margin from Bode Plot. Relative stability based on the slope of the Log Magnitude curve. Determination of transfer function from Bode plot. Principle of Argument. Nyquist stability criterion. Relative stability using Nyquist criterion – Gain and Phase Margin. Closed-loop frequency response.

Unit – IV: Compensators & Controllers

Types of Compensators- Lead Compensator, Lag Compensator, Lag – Lead Compensator. Realization of Basic Compensators. P, P-I, P-D, P-I-D Controllers. Effects of the controller on the performance of the system. Applications of Proportional, Integral and Derivative Controllers. Applications of Lead, Lag compensating networks

Unit – V: State Variable Analysis and Concepts of State Variables

Modern Control Theory versus Conventional Control Theory. Concept of State, State Variable, State Space and State space model. State Space representation by Physical Variables, Phase Variables. Direct Decomposition, Cascade Decomposition, Parallel Decomposition. Diagonalization of State Matrix. Solution of state equations. Computation of the State Transition Matrix. Eigen values and Stability Analysis. Concept of controllability and observability. Testing for Controllability and Observability.

Suggested Readings:

1. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.
2. A. Anand Kumar, “Control Systems”, PHI Learning Pvt. Ltd., 2007.
3. A. Nagoor Kani, “Control Systems”, RBS Publications.

Reference Books:

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. M.Gopal, “Control Systems: Principles and Design”, Mc Graw Hill Education, 1997.
3. A. K. Jairath, “Problems and Solutions in Control Systems” Khanna Publishers.
4. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

L	T	P	C
3	0	0	3

IV Semester Syllabus
EE403PC: Power Systems - I

Prerequisites: Basic concepts of Electrical Engineering

Course Objectives

- To understand the different types of power generating stations
- To examine A.C. and D.C. distribution systems
- To understand and compare overhead line insulators and Insulated cables
- To illustrate the economic aspects of power generation and tariff methods
- To evaluate the transmission line parameters calculations
- To understand the concept of corona

Course Outcomes

At the end of this course, students will demonstrate the ability to

- Understand the concepts of power systems
- Understand the operation of conventional generating stations and renewable sources of electrical power
- Evaluate the power tariff methods
- Determine the electrical circuit parameters of transmission lines
- Understand the layout of substation and underground cables and corona

Unit–I: Generation of Electric Power

Importance of Electrical Energy, Generation of Electrical Energy, Hydro station, Steam Power Plant, Schematic Arrangement of Steam Power Station, Equipment of Steam Power Station, Nuclear Power Plant, Schematic Arrangement of Nuclear Power Station and Gas Turbine Plant, Schematic Arrangement of Gas Turbine Power Plant, Non-Conventional Sources (Qualitative): Tidal Energy – Single basin and Double basin systems, Wind Power and Introduction to Solar Energy – Flat plate collectors and Photovoltaics.

Unit-II: Economics of Generation

Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load Curve, Load duration curve, Information and utility of load curve, number and size of generator units, units generated per annum, Base load and peak load plants, Importance of High Load Factor, Cost of electrical energy-fixed cost, running cost, tariff or charge to customer, Desirable Characteristics of a Tariff, Types of Tariff – Simple tariff, flat rate tariff, block rate tariff, two part tariff, three part tariff, maximum demand & power factor tariff.

Unit-III: Overhead Line Insulators & Insulated Cables

Introduction to insulators, types of insulators - Pin type, Suspension type, and Strain type insulators, Potential distribution over a string of suspension insulators, string efficiency, Methods of equalizing the potential distribution – Using longer cross-arms, Grading of Units, Static Shielding. Introduction to insulated cables, insulating materials, types of cables, most economical size of a cable, grading of cables – capacitance and inter sheath grading, insulation resistance of a cable, Capacitance of a single core and three core cables.

Unit-IV: Inductance & Capacitance Calculations of Transmission Lines

Types of Line Conductors, flux linkages, skin effect, Resistance of Transmission line, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, concept of self GMD and mutual GMD, Composite conductors, transposition, bundled conductors, and effect of earth on capacitance. **Corona:** Introduction, corona characteristics - disruptive critical voltage, visual critical disruptive voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Advantages and disadvantages of corona, interference between power and Communication lines.

Unit-V: Distribution Systems

AC Distribution: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system. Voltage Drop Calculations (Numerical Problems) in AC Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages, Selection of site for substation, major equipments in substation, busbar arrangement.

DC Distribution: Classification of Distribution Systems, Comparison of DC (vs.) AC and Under-Ground (vs.) Over-Head Distribution Systems, Requirements and Design features of Distribution Systems, Voltage Drop Calculations (Numerical Problems) in DC Distributors for the following cases: Radial DC Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

Suggested Readings:

1. C.L. Wadhwa–Generation, Distribution and Utilization of Electrical Energy, Second Edition, New Age International, 2009.
2. J. B. Gupta, “A course in Electric Power Systems”, Katson Books.
3. P.V.Gupta, M. L. Soni, U. S. Bhatnagar, “A textbook on Power Systems Engineering”, Dhanpat Rai & co, 2013.

Reference Books:

1. C. L. Wadhwa–Electrical Power Systems, Fifth Edition, New Age International, 2009.
2. M.V. Deshpande–Elements of Electrical Power Station Design, Third Edition, Wheeler Pub. 1998.

L	T	P	C
3	0	0	3

IV Semester Syllabus
EC431PC: Digital Electronics

Course Objectives

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
- To implement synchronous state machines using flip-flops.

Course Outcomes

Upon completing this course, the student will be able to

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Be able to use PLDs to implement the given logical problem.

Unit – I: Fundamentals of Digital Systems and Logic Families

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families ,RTL,DTL, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

Unit – II: Combinational Digital Circuits

Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial ladder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

Unit – III: Sequential Circuits and Systems

A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J, K, T and D types flip-flops, applications of flip-flops, shift registers, applications of shift register, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

Unit – IV: A/D and D/Converters

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs.

Unit – V: Semiconductor Memories and Programmable Logic Devices

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Suggested Readings:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

L	T	P	C
0	0	2	1

IV Semester Syllabus
EE451PC: Electrical Machines Lab–II

Prerequisites: Electrical Machines-II

Course Objectives

- To understand the operation of synchronous machines
- To understand the analysis of power angle curve of asynchronous machine
- To understand the equivalent circuit of a single phase transformer and single phase induction motor
- To understand the circle diagram of an induction motor by conducting a blocked rotor test.

Course Outcomes

After completion of this lab, the student will be able to

- Assess the performance of different machines using different testing methods
- To convert the Phase from three phase to two phase and vice versa
- Compensate the changes in terminal voltages of synchronous generator after estimating the change by different methods
- Control the active and reactive power flows in synchronous machines
- Start different machines and control the speed and power factor

The following experiments are required to be conducted as compulsory experiments

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on a pair of single phase transformers
3. No-load & Blocked rotor tests on three phase Induction Motor
4. Regulation of a three–phase alternator by synchronous impedance & mmf. methods
5. Separation of core losses of a single phase transformer
6. Equivalent Circuit of a single phase Induction Motor
7. Determination of X_d and X_q of a salient pole synchronous machine
8. Load test on three phase Induction Motor

In addition to the above experiments, at least any two of the following experiments are required to be conducted from the following list

1. Efficiency of a three-phase Alternator
2. Parallel operation of Single-phase Transformers
3. Regulation of three-phase Alternator by Z.P.F. and A.S.A methods
4. Heat run test on a bank of 3Nos of single phase Delta connected transformers
5. V and Inverted V curves of a three-phase Synchronous Motor.
6. Measurement of sequence impedance of a three-phase Alternator.
7. Vector grouping of three phase Transformer
8. Scott connection of Transformer.

L	T	P	C
0	0	2	1

IV Semester Syllabus
EE452PC: Control Systems Lab

Prerequisites: Control Systems

Course Objectives

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis
- To design various controllers and compensators to improve system performance

Course Outcomes

After completion of this lab, the student will be able to

- Improve the system performance by selecting a suitable controller and/or a compensator for a specific application
- Apply various time domain and frequency domain techniques to assess the system performance
- Apply various control strategies to different applications

The following experiments are required to be conducted compulsory experiments:

1. Time response of Second order system
2. Characteristics of Synchros
3. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using suitable software
4. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Transfer function of DC generator
7. Temperature controller using PID
8. Characteristics of AC servomotor

In addition to the above eight experiments, at-least any two of the experiments from the following list are required to be conducted

1. Effect of P, PD, PI, PID Controller on a second order systems.
2. Lag and lead compensation–Magnitude and phase plot.
3. (a) Simulation of P, PI, PID Controller.
   (b) Linear system analysis (Time domain analysis, Error analysis) using suitable

software.

4. State space model for classical transfer function using suitable software - Verification.
5. Design of Lead-Lag compensator for the given system and with specification using suitable software.
6. Programmable logic controller–Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of motor.

L	T	P	C
0	0	2	1

IV Semester Syllabus
EC461PC: Digital Electronics Lab

Course Objectives

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and be able to convert different representations into one another
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.

Course Outcomes

Upon successful completion of the course, students will be able to

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Be able to use PLDs to implement the given logical problem.

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design of a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4-bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
8. Design and realization of Synchronous and Asynchronous counters using flip-flops
9. Design and realization of Asynchronous counters using flip-flops
10. Design and realization of 8x1 using 2x1 mux
11. Design and realization of 2-bit comparator
12. Verification of truth tables and excitation tables
13. Realization of logic gates using DTL, TTL, ECL, etc.,
14. State machines

Suggested Readings:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer Design", Pearson Education India, 2016.

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

L	T	P	C
0	0	2	1

IV Semester Syllabus

EN452HS: Finishing School- II

(Common to all Branches)

Course Overview

In view of the growing importance of English as a tool for global Communication and the consequent emphasis on training students to acquire language skills, this syllabus has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

Course Objectives

The main objective of this finishing school curriculum is to provide content for developing the LSRW skills of language learning and to facilitate proficiency in both receptive and productive skills, among students.

Methodology:

- Students will be given Reading/Listening exercises that they would have to do as a prerequisite for the class room intervention.
- Every Session will have activities on all the four skills. Listening, Speaking, Reading and Writing.
- Vocabulary exercises will also be a part of every session
- Students will be asked to summarize their takeaways in every class in three sentences.
- The students will be given a self-study plan for language enhancement and will be given extra reading and writing exercises as and when necessary.
- To personalize learning, a variety of case studies and structured problem solving activities will be given in small groups and the trainers will facilitate peer reviews.

Unit-I: Discussions and Debates

Module Overview:

The module enables the students to build strategies for effective group interaction. It focuses on developing decisive awareness and positive personality while maintaining emotional balance.

Learning Outcomes:

The students should be able to:

- Participate in group discussions by providing factual information, real time solutions, and examples.
- Debate on a topic by picking up the key points from the arguments offered.

Competencies:

- Analytical and Probing Skills
- Interpersonal Skills
- Identifying key points of the debate.
- Problem solving ability
- Constructing a logical chain of arguments and presenting winning view points.

Sessions:

1. Six Thinking Hats
2. Initiation Techniques
3. Generating points
4. Summarization Techniques

Unit-II: Powerful Presentations

Unit Overview:

Presentations need to be clear and logical. This Module is designed to introduce students to an ideal structure for a presentation

Learning Outcomes:

Students should be able to:

- Prepare, present, and analyze reports
- Analyze the points discussed
- Connect all points logically with coherence
- Connectives
- Communicate the decisions
- Provide logical conclusions

Sessions:

1. Persuasion skills
2. Cultivate appropriate body language and group dynamics
3. Debating Structure and Content
4. Case Study based Group Discussions

Unit-III: Effective Technical Writing

Unit Overview:

Organizing the writing in a logical order, using headings, linkers and sequence markers. This module is designed to give the students inputs on how to organize using Information Mapping. The students are also given inputs to correct spelling, language and Punctuation errors, as part of editing.

Learning Outcomes:

The Students should be able to choose appropriate words and tone to present accurate, specific and factual written documents.

Competencies:

- Reporting an incident

- Writing/Presenting an essay
- Language and Vocabulary

Sessions:

1. Information Mapping
2. Report writing
3. Memos
4. SoP (Statement of Purpose)
5. MoM (Minutes of the Meeting)

Unit-IV: Reading for Content and Context

Unit Overview:

This course is designed to develop and improve reading and study skills needed for employability. Topics include identifying main idea and supporting details, determining author's purpose and tone, distinguishing between fact and opinion, identifying patterns of organization in a paragraph or passage and the transition words associated with each pattern. Also recognizing the relationship between sentences, puzzling out meanings in context, identifying logical inferences and conclusions.

Learning Outcomes:

Upon completion of the course, students should be able to:

1. Compose a summary of a given text.
2. Apply reading skills appropriate to different genres

Competencies

- Distinguish facts from opinions.
- Make inferences
- Identify author's purpose, point of view, tone, and perspective.
- Comprehend the use of figurative language.
- Synthesize information gathered from reading in order to give informedopinion.

Sessions:

1. Skimming and Scanning Techniques
2. Recognition of author's purpose
3. Awareness of stylistic differences
4. Evaluation and Discernment of fact and opinion.

Unit-V: Critical Reading Skills

Unit Overview:

Research shows that good reading skills can lead to well written assignments. In this unit, students will learn reading strategies to understand and retain information, organization of reading passages, and strategies for learning and retaining vocabulary. Building on these basic strategies, students will develop skills to critically analyze texts. In addition, students will practice and develop paraphrasing and summarizing skills. Students' feedback is integral to the learning process.

Learning Outcomes:

- Recognition of propaganda techniques
- Present vocabulary building methods
- Use comprehension and vocabulary strategies to improve reading skills.

Competencies:

The students will develop enhanced ability to apply the following critical thinking skills when reading:

a. Understand the meaning of new vocabulary through:
1. Context clues, e.g., synonyms, antonyms, examples, definitions, and restatements, etc.
2. Roots and affixes

b. Analyze text (simple outlining and note taking) summarize, draw conclusions, and apply information to personal experiences.

Sessions

1. Contextual Vocabulary-One-word substitutes
2. Homophones, Homonyms and Homographs
3. Idioms and Phrases
4. Synonyms, Antonyms and Phrasal verbs
5. Note making and Inference
6. Main idea identification
7. Précis Writing.

Reference Books:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan, Pearson 2007.
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd., 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning Pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. Mc Murrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.
10. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd., 2nd Edition.

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IV Semester Syllabus

MC451HS: Gender Sensitization Lab

(An Activity-based Course)

[Common to CE, EEE, ECE, ME, MCT & MME]

Course Objectives

This course aims:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debate on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Course Description

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science,

anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Unit-I: Understanding Gender

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male.

Unit-II: Gender Roles and Relations

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary.

Unit-III: Gender and Labour

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

Unit–IV: Gender - Based Violence

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

Domestic Violence: Speaking Out -Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life….".

Unit – V: Gender and Culture

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive

Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of **English Literature** or Sociology or Political Science or **any other qualified faculty who has expertise in this field from engineering departments.**

- Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".

Suggested Readings:

- The Textbook, "Towards a World of Equals: A Bilingual Text Book on Gender" written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

Assessment and Grading:

- Discussion & Classroom Participation: 20%.
- Project/Assignment: 30%.
- End Term Exam: 50%.