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# DETAILED SYLLABUS
## FIRST SEMESTER

### Engineering Mathematics

Fourier series:

Introduction: Euler's formula; Problems on general Fourier Series; Conditions for Fourier Expansion; Fourier Expansions of Discontinuous Functions; Even and Odd functions; Change of interval; Half range series; Typical Waveforms (Square, Saw-toothed, Triangular, Half Wave rectifier, Full Wave rectifier); Parseval's Identity (statement only); Fourier Transform (FT) and its properties; Inverse Fourier Transform (statement only); Fourier transform of derivative (statement only); Convolution (statement only); Application of Fourier Transform in solving partial differential equations — Laplace's Equation (2D only), Heat Conduction Equation (1D only) and Wave Equation (1D only).

Calculus of Complex Variable:

Functions; Limits and Continuity; Analytic Functions; Cauchy Riemann Conditions; Analytic Continuation; Complex Integration and Cauchy's Theorem; Cauchy's Integral Formula; Taylor's and Laurent Series; Zeros of an Analytic Function; Poles; Essential Singularities; Residue Theorem (statement only) and it's application to evaluation of integral; Introduction to Conformal Mapping; Simple problems.

Probability and Statistics:

Mean, Median, Mode and Standard Deviation; Samples Space; Definition of Probability; Conditional Probability; General Multiplication Theorem; Independent Events; Bayes' Theorem; Random Variable; Discrete and Continuous Probability Distributions - Probability mass function; Probability density function; Distribution Function; Expectation; Variance; Probability Distribution—Binomial, Poisson and Normal. Correlation and Regression; Method of Least Squares; Linear Curve Fitting.

Graph Theory:

Graphs; Digraphs; Isomorphism; Walk; Path; Circuit; Shortest Path: Dijkstra's Algorithm; Tree; Properties of Tree; Binary Tree; Fundamental Circuit; Minimal Spanning Tree: Kruskal's Algorithm; Prim's Algorithm. Cut Set; Fundamental Cut Set and Cut Vertices; Matrix Representation of Graphs (Adjacency and Incidence Matrices); Network; Flow Augmenting Path; Ford-Fulkerson Algorithm for Maximum Flow; Max Flow – Min Cut Theorem (statement only).

Books:


1. Rathor, Choudhari,: Descrete Structure And Graph Theory.
2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics - SultanChand & Sons.
3. Lipschutz S: Theory and Problems of Probability (Schaum's Outline Series) -McGraw Hill
4. Spiegel M R: Theory and Problems of Probability and Statistics (Schaum'sOutline Series) -
5. Goon A.M., Gupta M K and Dasgupta B: Fundamental of Statistics - The World Press Pvt.
6. Spiegel M R: Theory and Problems of Complex Variables (Schaum's OutlineSeries)
7. Bronson R: Differential Equations (Schaum's Outline Series) - McGraw Hill Book Co.
8. Ross S L: Differential Equations - John Willey & Sons.
9. Sneddon I. N.: Elements of Partial Differential Equations - McGraw Hill Book Co.
10. West D.B.: Introduction to Graph Theory - Prentice Hall

**Engineering Thermodynamics**

Module -I

Basic concept: thermodynamics system and surroundings, state properties, processes and cycles, thermodynamic equilibrium, heat and work transfer across boundary. Quasi-static process. Zeroth law and concept of thermal equilibrium.

First law of thermodynamics: first law for a closed system undergoing a cycle and undergoing a change of state. Internal energy as a system property, specific heats.

Module-II

Second law of thermodynamics: reversible and irreversible processes. Equivalence of Kelvin-Plank and Clausius statement, Carnot cycle and its efficiency. Inequality of Clausius and entropy concept. Change of entropy for various processes. Temperature-Entropy diagram.

Module-III

Properties of gases and vapours: Ideal gas law, Entropy change of an ideal gas. Properties of steam. Measurement of dryness fraction. Use of steam table, T-s diagram and H-s diagram for representing thermodynamics processes.

Module-IV

Air standard cycle and introduction to IC engines: Otto, diesel and dual cycles, Description and operation of four stroke and two stroke SI and CI engines, Power output and efficiency calculation.

Reciprocating Air compressor: Work required for single and two stage air compressor. Effect of inter cooling, optimum inter stage pressure. Effect of clearance on volumetric efficiency.

Text books:

1. Engineering thermodynamics By P.K.Nag, Tata Mc Grawhill Reference books:
2. Thermal engineering By P.L Ballaney – Khanna Publishers
3. A course in thermodynamics By Kothaandaraman, Khajuria & Domkundwar – Dhanpat Rai & Sons.

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## COMMUNICATION SKILLS *(First Semester)*

### *Module I (10 Hours)* Fundamentals of Communication

- Communication: Process, pattern and stages of communication, channels and types of communication and Barriers to Communication.
- Functions of language: Descriptive, Expressive and Social Functions.
- Formal and Informal English
- Plain English
- Bias free language

### *Module II (10 Hours)* Communicative Grammar

- Time, Tense and Aspects
- Verbs of State and Events
- Use of Modal Verbs
- Phrasal Verbs
- Passive and Active Voice
- Conditionals

### *Module III (10 Hours)* Sounds of English

- The Speech Mechanism and Organs of Speech
- Consonant Sounds of English
- Vowel Sounds of English
- Stress Pattern: Syllable, Stress and Intonation.
- Problem sounds for Indian Speakers

### *Module IV (10 Hours)* Business and Official Writing

- Paragraph writing and Sentence Linker
- Business and Official Letters
- Report and Proposal writing,
- Notice, Circular and Memo writing
- Résumé (CV) Writing.

**Text Books:**


1. Effective Technical Communication by M Ashraf Rizvi (Tata McGraw Hill)
2. Better English Pronunciations By J. D.O Conner ( Cambridge University Press)
3. A Communicative Grammar of English by G.N. Leech and Jan Svartik (OUP)


**Reference Books**:


1. "Business communication" by Ramachandran, Lakshmi and Krishna (Macmillan)

# Network Theory

**MODULE-I**

Coupled Circuits: Self-inductance and Mutual inductance, Coefficient of coupling, dot convention, Ideal Transformer, Analysis of multi-winding coupled circuits, Analysis of single tuned and double tuned coupled circuits. Transient study in RL, RC, and RLC networks by Laplace transform method with DC and AC excitation. Response to step, impulse and ramp inputs. Two Port networks: Two port parameters, short circuit admittance parameter, open circuit impedance parameters, Transmission parameters, Image parameters and Hybrid parameters. Ideal two port devices, ideal transformer. Tee and Pie circuit representation, Cascade and Parallel Connections.

**MODULE-II**

Network Functions & Responses: Concept of complex frequency, driving point and transfer functions for one port and two port network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function. Impulse response and complete response. Time domain behavior form pole-zero plot. Three Phase Circuits: Analysis of unbalanced loads, Neutral shift, Symmetrical components, Analysis of unbalanced system, power in terms of symmetrical components

**MODULE-III**

Network Synthesis: Realizability concept, Hurwitz property, positive realness, properties of positive real functions, Synthesis of R-L, R-C and L-C driving point functions, Foster and Cauer forms

**MODULE-IV**

Graph theory: Introduction, Linear graph of a network, Tie-set and cut-set schedule, incidence matrix, Analysis of resistive network using cut-set and tie-set, Dual of a network.

Filters: Classification of filters, Characteristics of ideal filters

BOOKS

[1]. Mac.E Van Valkenburg, *"Network Analysis"*,
[2]. Franklin Fa-Kun. Kuo, *"Network Analysis & Synthesis"*, John Wiley & Sons.
[3]. M. L. Soni, J. C. Gupta, *"A Course in Electrical Circuits and Analysis"*,
[4]. Mac.E Van Valkenburg, *"Network Synthesiss"*,
[5]. Joseph A. Edminister, Mahmood Maqvi, *"Theory and Problems of Electric Circuits"*, Schaum's Outline Series, TMH

# Electrical Machines

**MODULE I**

D.C Generator – construction and principle of operation, E.M.F. equation ; types of generator; no load and load characteristics; Voltage build-up of shunt Generator; voltage regulation, Application. D.C Motor –construction and principle of operation, back E.M.F; torque and speed equations; characteristics and performance curves; speed control of series and shunt motors; motor starters; industrial application. Losses and Efficiency of D.C machines.

**MODULE II**

Single phase Transformer – construction and principle of operation; E.M.F. equation; Phasor diagram; actual and approximate equivalent circuits; open and short circuit tests, voltage regulation; losses and efficiency.

Three Phase Transformer – Construction and principle of operation; connection of three single – phase units in wye, delta, open delta configurations; Autotransformer; conventional transformer connected as Autotransformer. Special Transformers – induction heating and high impedance and high frequency transformer.

**MODULE III**

Three- phase alternators – construction and principle of operation; E.M.F. equation; distribution and pitch factors; Synchronous reactance; performance of alternators on no-load and load; Phasor diagram; voltage regulation, power calculations of turbine and hydro-generators, synchronization of a generator. Three-Phase Synchronous Motor- construction and principle operation; V- curves; Phasor diagram; methods of starting; applications.

**MODULE IV**

Three-Phase induction Motor- construction of slip ring and squirrel cage type induction motors, Phasor diagram and equivalent circuit; torque-slip characteristics; maximum torque calculations; open and short-circuit tests; losses and efficiency; starting of induction motors; speed control;

4. Voltage regulation of alternator by
5. Synchronization of alternator with infinite bus.
6. Load characteristics of DC shunt generator

Induction generator. Single-Phase Induction Motor - construction and principle of operation; capacitor- start and capacitorrun motors.

**BOOKS**

[1]. J.Nagrath & D.P.Kothari, *"Theory and problems of Electrical Machines"*, TMH Publicat New Delhi

[2]. P. S. Bhimbra, *"Electrical Machinary"*, Khanna Publishers, New Delhi

**Mechanical Engineering Lab**

Group A (Mechanics / Material Testing Lab.

1. Determination of equilibrium of coplanar forces.
2. Determination of Moment of Intertia of Flywheel
3. Determination of tensile strength of materials by Universal Testing Machine.

**Group B**

4. Determination of Metacentric Height and application to stability of floating bodies.
5. Verification of Bernoulli's Theorem and its application to Venturimeter.
6. Determination of Cd and Cd of Orifices.

**Group C**

7. Calibration of Bourden Type Pressure gauj and measurement pressure using manometers.
8. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.
9. Study of Cut-Sections of 2 stroke and 4 stroke Petrol Engine.

**Network Theory Lab**

1. Verification of Superposition and Thevenin's Theorem.
2. Verification of Maximum Power Transfer Theorem.
3. Find out the band width, Q-factor and resonance frequency of a R-L-C series circuit.
4. Transient response of a D.C. R-L, R-C and R-L-C circuit.
5. Determination of A,B,C,D,Z,Y and h parameters of a two port network.
6. Spectral Analysis of a non-sinusoidal waveform.

**Electrical Machines Lab**

1. Open circuit test and short circuit test on single phase transformer
2. Swinburne test and brake test of DC shunt machine
3. Speed control of a 3 phase induction motor
4. Voltage regulation of alternator by EMF method
5. Synchronization of alternator with infinite bus.
6. Load characteristics of DC shunt generator