Tentative Curriculum and Syllabus

of

B.Tech (Mechanical Engineering) from the Batch 2018-19

Semester (4th)
## Fourth Semester

### Theory

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Category</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L-T-P</th>
<th>Credit</th>
<th>University Marks</th>
<th>Internal Evaluation</th>
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<tr>
<td>1</td>
<td>PC</td>
<td>RME4C001</td>
<td>Kinematics &amp; Dynamics of Machines</td>
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<td>RME4C003</td>
<td>Introduction to Physical Metallurgy and Engineering Materials</td>
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<td>5</td>
<td>PE</td>
<td>RME4D001</td>
<td>Internal Combustion Engines and Gas Turbines</td>
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<td>Advanced Mechanics of Solids</td>
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<td>Digital Systems Design</td>
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<td>Microprocessor and Microcontroller</td>
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<td>Data Structure</td>
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<td>MC*</td>
<td>RCN4F001</td>
<td>Constitution of India</td>
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**Total Credit (Theory)**: 18  
**Total Marks**: 600  
**Total Semester Credit**: 24  
**Total Marks**: 300

### Practical

<table>
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<tr>
<th>Sl No</th>
<th>Category</th>
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<td>3</td>
<td>PC</td>
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<td>Introduction to Physical Metallurgy and Engineering Materials Laboratory</td>
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**Total Credit (Practical)**: 6

*Mandatory Non-Credit Courses (MC) result will be reflected with Pass (P) / Fail (F) grade. Thus the grade obtained will not be affecting the grade point average. However it shall appear on the grade sheet as per AICTE rule.*
Module – I : (12 hrs)

**Kinematic fundamental:** Basic Kinematic concepts and definitions, Degrees of freedom, Elementary Mechanism: Link, joint, Kinematic Pair, Classification of kinematic pairs, Kinematic chain and mechanism, Gru ebler’s criterion, Inversion of mechanism, Grashof criteria, Four bar linkage and their inversions, Single slider crank mechanism, Double slider crank mechanism and their inversion. Transmission angle and toggle position, Mechanical advantage.

**Kinematic Analysis:** Graphical analysis of position, velocity and acceleration of four bar and Slider crank mechanisms. Instantaneous centre method, Aronhold-Kennedy Theorem, Rubbing velocity at a Pin-joint. Coriolis component of acceleration.

Module – II : (10 hrs)

**Gear and Gear Trains:** Gear Terminology and definitions, Theory of shape and action of tooth properties and methods of generation of standard tooth profiles, Standard proportions, Force analysis, Interference and Undercutting, Methods for eliminating Interference, Minimum number of teeth to avoid interference. Analysis of mechanism Trains: Simple Train, Compound train, Reverted train, Epicyclic train and their applications.

Module – III : (8 hrs)

**Combined Static and Inertia Force Analysis:** Inertia forces analysis, velocity and acceleration of slider crank mechanism by analytical method, engine force analysis - piston effort, force acting along the connecting rod, crank effort. dynamically equivalent system, compound pendulum, correction couple.

Module – IV : (8 hrs)

**Friction Effects:** Screw jack, friction between pivot and collars, single, multi-plate and cone clutches, anti friction bearing, film friction, friction circle, friction axis.

**Flexible Mechanical Elements:** Belt, rope and chain drives, initial tension, effect of centrifugal tension on power transmission, maximum power transmission capacity, belt creep and slip.

Module – V : (7 hrs)

**Brakes & Dynamometers:** Classification of brakes, Analysis of simple block, Band and internal expanding shoe brake, Braking of a vehicle. Absorption and transmission dynamometers, Prony brake, Rope brake dynamometer, belt transmission, epicyclic train, torsion dynamometer.

**Books:**
- Kinematics and Dynamics of Machinery by R L Norton, Tata MacGraw Hill
- Theory of Machines by S.S.Rattan, Tata MacGraw Hill
- Theory of Machines by Thomas Bevan, CBS Publications
- Kinematics and Dynamics of Machinery by Charles E. Wilson and J.Peter Saddler,
4th Semester

- Kinematics and Dynamics of Machines by G.H. Martin, McGraw-Hill.
- Theory of Machines and Mechanisms by P.L. Ballaney, Khanna Publishers
- Theory of Mechanisms and Machines by C.S. Sharma and K. Purohit, PHI.
Laboratory Experiments: (Minimum 8 experiments)

1. Design of any one working model related to Kinematics of Mechanisms i.e., Module I and II.
2. Design of any one working model related to Dynamics of Machinery i.e., Module III and IV.
3. Radius of gyration of compound pendulum
4. Radius of gyration of connecting rod
5. TRI–FILAR / BI-FILAR System
6. Experiment on Screw Jack
7. Experiment on Journal Bearing Apparatus
8. Experiment on Epicyclic Gear Train
9. Experiments on Simple/Compound/Reverted Gear trains
10. Experiment on Dynamometer
11. Experiment on Brake
12. Experiment on Coriolis component of acceleration
Module-I (08 hrs)

Review of First and Second laws, First law analysis of steady and unsteady flow control volumes, Entropy generation, Entropy balance for closed systems and steady flow systems.

Module- II (12 hrs)

Available energy, Quality of energy, Availability for non flow and flow process, Irreversibility, Exergy balance, Second law efficiency.


Module- III (10 hrs)


Module- IV (08 hrs)


Refrigeration cycles: Reversed Carnot cycle, Reversed Brayton cycle (Gas refrigeration system), The vapor compression cycle, The vapor absorption cycle.

Module- V (07 hrs)

Reciprocating Air Compressors: Introduction (Uses of compressed air), The reciprocating cycle neglecting and considering clearance volume, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Performance and design calculations of reciprocating compressors, Air motors.

Books:

- Engineering Thermodynamics by P. K. Nag, Publisher:TMH
- Engineering Thermodynamics by P. Chattopadhyay, OXFORD
- Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, John Wiley & Sons
- Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, PHI
- B.Tech (Mechanical Engineering ) detail Syllabus for Admission Batch 2015-16 3rd Semester
- Thermodynamics An Engineering Approach by Yunus A.Cingel and Michale A.Boles, TMH
- Engineering Thermodynamics by M.Achyuthan, PHI
- Engineering Thermodynamics by Y.V.C. Rao, University Press
- Thermodynamics and Thermal Engineering by Kothandaraman & Domkundwar, Dhanpat Rai
- Applied Thermodynamics by P.L. Ballaney, Khanna Publishers
- Steam Tables in SI Units by Ramalingam, Scitech
- Steam Tables by C.P. Kothandaraman, New Age International
- Fundamentals of Engineering Thermodynamics by Michale J. Moran and Howard N. Shapiro, John Wiley & Sons
Laboratory Experiments: (Minimum 8 experiments)

1. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine/Petrol engine.
2. Study of steam power plant.
3. Study of refrigeration system.
4. Study of gas turbine power plant.
5. Performance analysis of reciprocating air-compressor.
7. Determination of performance characteristics of gear pump.
8. Measurement of steam quality using calorimeter
9. Verification of Joule-Thomson coefficient
10. Load test on 4-stroke single cylinder C.I. engine.
11. Load test on 4-stroke single cylinder S.I. engine.
12. Morse Test on multi-cylinder S.I. or C.I. engine
Module - I (10 hours)


**Demand** - Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Demand Forecasting – Meaning

**Supply** - Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Module - II (08 hours)

**Production** - Production function, Laws of returns: Law of variable proportion, Law of returns to scale

**Cost and Revenue Concepts** - Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization.

Module III (08 hours)

**Market** - Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Module - IV (12 hours)

**Time Value of Money** - Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.


**Depreciation** - Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation - Straight line method, Declining balance method, SOYD method, After tax comparison of project.

Module –V (07 Hours)

**Inflation** - Meaning of inflation, types, causes, measures to control inflation.

**National Income** - Definition, Concepts of national income, Method of measuring national income.

**Banking** - Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

**Books:**
5. R. Paneer Seelvan, “Engineering Economics”, PHI
8. Macro Economics by S.P. Gupta, TMH
Course Outcomes of Engineering Economics

At the end of the course the engineering graduates will be able to

1. **Remembering**: Define the basic concept of micro and macro economics, engineering economics and their application in engineering economy.

2. **Understanding**: Evaluate numerically the effects of changes in demand and supply on price determination of products and services.

3. **Analyze**: the macroeconomic environment and financial systems of the country and its impact on business, society and enterprise.

4. **Develop**: the ability to account for time value of money using engineering economy factors and formulas.

5. **Apply**: knowledge of mathematics, economics and engineering principles to solve engineering problems and to analyze decision alternatives in engineering projects considering upon depreciation, taxes and inflation.
Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Module-I: (06 Hrs.)

Fundamentals of OB: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.

Module-II: (12 Hrs.)

Attitude: Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes.

Personality and values: Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.

Perception: Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

Motivation: Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow’s Need Hierarchy & Herzberg’s Two Factor model Theory), The Process Theories (Vroom’s expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

Module-III: (10 Hrs.)


Leadership: Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today’s Global and Indian leaders.

Module-IV: (08 Hrs.)

Organizational Culture: Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.
Module-V: (09 Hrs.)

Organizational Change: Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change: How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin’s-Three step model, Seven Stage model of Change & Kotter’s Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

Books:
1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley
MODULE-I  (10 hrs)
Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

MODULE-II  (10 hrs)
Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing; recovery; recrystalization and grain growth; hot working. Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; orderdisorder transformation.

MODULE-III (10 hrs)
Binary phase diagrams (a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d)Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems. Effect of non-equilibrium cooling, coring and homogenization. Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses Specification of steel.

MODULE-IV  (09 hrs)
T.T.T. diagram, concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability. Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

MODULE-V  (08 hrs)

Books:
- Introduction to Physical Metallurgy by Avner, Tata McGraw Hill
- Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.
- Physical Metallurgy: Principles and Practice by Ragahvan, PHI
• Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.
• Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley
• Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.
• Elements of Materials Science & Engineering by Van Vlack, Pearson
• Mechanical Metallurgy by Dieter, Tata MacGraw Hill
• Composite Material science and Engineering by K. K. Chawla, Springer
• Material Science and Metallurgy, by U. C. Jindal, Pearson
<table>
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<th>4th Semester</th>
<th>RME4C203</th>
<th>Introduction to Physical Metallurgy and Engineering Materials Laboratory</th>
<th>L-T-P</th>
<th>2 CREDITS</th>
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**Laboratory Experiments (Minimum 8 experiments)**

1. Study of Crystal Structures through Ball Models
2. Metallurgical Microscope: Principles and Operations
3. Specimen Preparation techniques for Metallographic Analysis
4. Microstructural Analysis of Carbon Steels
5. Microstructural Analysis of Cast Iron
6. Microstructural Analysis of Non-Ferrous Metals: Brass & Copper
7. Jominy end quench test
8. Heat treatment of Steels
9. Hardness testing of ferrous material.
10. Impact testing (Charpy/Izod)
MODULE - I (10 hrs)

Introduction : Classification, Engine nomenclature, engine operating and performance parameters, Valve timing diagram of SI & CI Engines, Comparison of SI and CI engine.


MODULE II (10 hrs)


Ignition : Energy requirement for ignition, requirements of an ignition system, conventional ignition systems, modern ignition systems (TCI and CDI), firing order, Ignition timing, Spark advance mechanism.

MODULE III (10 hrs)


Module-IV (8 hrs)


**Cooling & Lubricating Systems, Engine Emission & Controls**: Air cooling & water cooling systems, Effect of cooling on power output & efficiency, Properties of lubricants and different types of lubricating system. Modern developments in IC Engines, EGR, MPFI, CRDI, GDI, HCCI, dual fuel engine, Lean burn engine, Stratified engine (basic principles).

**Emission and control**: Mechanism of pollutant formation and its harmful effects. Methods of measuring pollutants and control of engine emission.

Module-V (07 hrs)

**Gas Turbines**: Introduction, Open and closed cycle gas turbines, Analysis of practical gas turbine cycle.

**Air Craft Propulsion**: Analysis of Turbo Jet, Turbo Prop, Turbo fan & Ram jet engines.

**Axial Flow & Centrifugal Compressor**: Basic construction of centrifugal and axial flow compressor, Velocity diagram, performance characteristics of centrifugal and axial flow compressor, effects of slip, surging and stalling on compressor.

**Books:**
- IC Engines, Mathur & Sharma
- Internal Combustion Engines, V. Ganesan, TMH, 3rd edition
- Gas Turbines, V.Ganesan, TMH, 3rd edition
- Fundamentals IC Engines, J.B.Heywood, McGraw Hill
- A course in IC Engines, V.M.Domkundwar, Dhanpat rai and sons
- Gas Turbines, Cohen and Roser
- An Introduction to Energy Conversion, Vol.III, V.Kadambi and Manohar Prasad, New Age International
- Fundamentals of Internal Combustion Engines, H.N.Gupta, PHI
- Internal Combustion Engines, K.K.Ramalngam, Scitech Publications
### Module – I (08 hrs)


**Static and Dynamic Characteristics of Instruments:** Static Performance Parameters, Impedance Loading and Matching, Selection and Specifications of Instruments, Dynamic Response, Compensation.

### Module-II (09 hrs)


**Strain Measurement:** The electrical resistance strain gauge. The metallic resistance strain gauge, Selection and installation factors for metallic strain gauge, Circuitry, metallic strain gauge. The strain gauge ballast circuit, the starring gauge bridge circuit, Temperature compensation.

### Module-III (08 hrs)

**Measurement of Pressure:** Pressure measurement systems, Pressure measurement transducers, Elastic diaphragms, strain gauge pressure cells, measurement of high pressure, Measurement of low pressures, dynamic characteristics of pressure measuring systems. Measurement of Fluid Flow, Flow characteristics obstruction meters, Obstruction meter for compressible fluids- Orifice, Venturimeter and Pitot tube, The variable-area meter, Turbine Flow meters.

**Temperature Measurement:** Use of bimetallic pressure thermometers, Thermocouples, Pyrometry, Calibration of temperature measuring devices. Force, Power, Speed and Torque Measurement: Load Cell, Dynamometers, Tachometer and Tacho-generator, Stroboscope, The seismic instrument.- Vibrometers and accelerometers

### Module – IV (10 hrs)


Limits, Fits and Gauges, Assembly by full, partial and group interchangeability, geometric tolerances.
MODULE – V (10 hrs)

Definition, bath-tub-curve, system reliability, reliability improvement, maintainability and availability. Availability of single repairable system using Markov model, Life tests, acceptance sampling plan based on life tests, Sequential acceptance sampling plan based on MTTF & MTBF.

Books:

- Engineering Metrology, R.K. Jain, Khanna Publisher, Delhi
- Introduction to reliability and Maintainability Engg. E. Ebeling, MC-Graw Hill.
MODULE – I(6 HOURS)
Elementary concept of elasticity, stresses in three dimensions, Principal Stresses, Stress Invariants, Mohr’s Circle for 3-D state of stress, Octahedral Stresses, State of pure shear, plane stress. Differential equations of equilibrium.

MODULE-II(10 HOURS)
Analysis of strain, State of strain at a point, Strain Invariant, Principal Strains, Plane state of strain, Strain measurements. compatibility conditions.

Energy Methods: Work done by forces and elastic strain energy stored. Reciprocal relations, Theorem of virtual work, Castigliano’s theorems,

MODULE – III(10 HOURS)
Bending of beams: Asymmetrical bending, Shear centre, Bending of curved beams, Stress distribution in beam with rectangular, circular and trapezoidal cross section, stresses in crane hooks, ring and chain links, Deflection of thick curved bars.

Axisymmetric problems: Thick walled cylinder subjected to internal and external pressures, Compound cylinders, Shrink fit,

MODULE – IV(6 HOURS)
Repeated stresses and fatigue in metals, Fatigue tests and fatigue design theory, Goodman, Gerber and Soderberg criteria, Concept of stress concentration, Notch sensitivity.

MODULE-V(8 HOURS)

Introduction to Fracture Mechanics: Basic modes of fracture, Fracture toughness evaluation.

Books:
• Advanced Mechanics of Solids, L.S. Srinath, Tata McGraw Hill
• Advanced Mechanics of Materials : Boresi and Schmdt, Willey
• Advanced Mechanics of Materials : Siley and Smith
• Strength of Materials Vol.II, by S.Timoshenko
• Mechanical Metallurgy by Dieter
• Strength of Materials by G. H. Ryder, Macmillan Press
• Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
• Mechanics of Materials by R.C.Hibbeler, Pearson Education
• Mechanics of Materials by James M. Gere, Thomson Learning
• Engineering Machanics of Solids by Egor P. Popov, Prentice Hall of India
• Strength of Materials by S.S.Rattan, Tata Mc Graw Hill
4th Semester | RME4G001 | Digital Systems Design | L-T-P | 3 CREDITS
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**MODULE – I (10 Hours)**

**Revision of Number System:** Introduction to various number systems and their Conversion. Arithmetic Operation using 1’s and 2’s Compliments, Signed Binary and Floating Point Number Representation Introduction to Binary codes and their applications.

**Revision Boolean Algebra and Logic Gates:** Boolean algebra and identities, Complete Logic set, logic gates and truth tables. Universal logic gates, Algebraic Reduction and realization using logic gates.

**MODULE – II (11 Hours)**

**Combinational Logic Design:** Specifying the Problem, Canonical Logic Forms, Extracting Canonical Forms, EX-OR Equivalence Operations, Logic Array, K-Maps: Two, Three and Four variable K-maps, NAND and NOR Logic Implementations.

**Logic Components:** Concept of Digital Components, Binary Adders, Subtraction and Multiplication, An Equality Detector and comparator, Line Decoder, encoders, Multiplexers and De-multiplexers.

**MODULE – III (8 Hours)**

**Synchronous Sequential logic Design:** sequential circuits, storage elements: Latches (SR, D), Storage elements: Flip-Flops inclusion of Master-Slave, characteristics equation and state diagram of each FFs and Conversion of Flip-Flops. Analysis of Clocked Sequential circuits and Mealy and Moore Models of Finite State Machines.

**MODULE – IV (9 Hours)**

**Binary Counters:** Introduction, Principle and design of synchronous and asynchronous counters, Design of MOD-N counters, Ring counters. Decade counters, State Diagram of binary counters.

**Shift resistors:** Principle of 4-bit shift resistors. Shifting principle, Timing Diagram, SISO, SIPO, PISO and PIPO resistors.

**Memory and Programmable Logic:** Types of Memories, Memory Decoding, error detection and correction), RAM and ROMs. Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

**MODULE – V (7 Hours)**

**IC Logic Families:** Properties DTL, RTL, TTL, I^2L and CMOS and its gate level implementation. A/D converters and D/A converters.

**College Level (20%)**

Basic hardware description language: Introduction to Verilog/VHDL programming language, Verilog/VHDL program of logic gates, adders, Subtractors, Multiplexers, Comparators, Decoders flip-flops, counters, Shift resistors.
Books:

- Fundamentals of digital circuits, 8th edition, A. Anand Kumar, PHI
- Digital Electronics, G. K. Kharate, Oxford University Press.
4th Semester

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<th>Module-I (10 Hours)</th>
<th>Microprocessor and Microcontroller</th>
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<tr>
<td><strong>Introduction to 8 bit and 16 bit Microprocessors-H/W architecture</strong></td>
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<td>Introduction to microprocessor, computer and its organization, Programming system; Address bus, data bus and control bus, Tristate bus; clock generation; Connecting Microprocessor to I/O devices; Data transfer schemes; Architectural advancements of microprocessors. Introductory System design using microprocessors; 8086 – Hardware Architecture; External memory addressing; Bus cycles; some important Companion Chips; Maximum mode bus cycle; 8086 system configuration; Memory Interfacing; Minimum mode system configuration, Interrupt processing.</td>
<td>RME4G002</td>
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Module -II (08 Hours)

**16-bit microprocessor instruction set and assembly language programming:**
Programmer’s model of 8086; operand types, operand addressing; assembler directives, instruction Set-Data transfer group, Arithmetic group, Logical group.

Module-III (08 Hours)

**Microprocessor peripheral interfacing:**
Introduction; Generation of I/O ports; Programmable Peripheral Interface (PPI)-Intel 8255; Sample-and-Hold Circuit and Multiplexer; Keyboard and Display Interface; Keyboard and Display Controller (8279).

Module-IV (12 Hours)

**8-bit microcontroller- H/W architecture instruction set and programming:**
Introduction to 8051 Micro-Controllers, Architecture; Memory Organization; Special Function register; Port Operation; Memory Interfacing, I/O Interfacing; Programming 8051 resources, interrupts; Programmer’s model of 8051; Operand types, Operand addressing; Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions; Programming.

Module-V (07 Hours)

**8086:** Maximum mode system configuration, Direct memory access, Interfacing of D-to-A converter, A-to-D converter, CRT Terminal Interface, Printer Interface, Programming of 8051 timers, 8051 serial interface, Introduction to 80386 and 80486 Microprocessor family.
Books:

- Microprocessor Architecture, Programming and application with 8085, R.S. Gaonkar, PRI Penram International publishing PVT. Ltd., 5th Edition
- Microcontrollers: Principles and Application, Ajit Pal, PHI Publication
- Textbook of Microprocessor and Microcontroller, Thyagarajan, Scitech Publication.
### Module - I  (12 Hrs.)

**Introduction:** Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

**Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

### Module – II  (08 Hrs.)

**Stacks and Queues:** ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

### Module - III  (08 Hrs.)

**Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

### Module - IV  (10 Hrs.)

**Sorting and Hashing:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

### Module - V  (07 Hrs.)

**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

**Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

### Books:

- “How to Solve it by Computer”, 2nd Impression by R.G. Dromey, Pearson Education.
Basic features and fundamental principles

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19