

The logo for Biju Patnaik University of Technology consists of several overlapping circles in blue, black, and yellow.

Biju Patnaik University of Technology, Odisha B.E./B.Tech MECH Sem 4 syllabus

Constitution of India

RCN4F001 Constitution of India

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”.

Digital Systems Design

RME4G001 Digital Systems Design

MODULE - I 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 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 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 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 registers: Principle of 4-bit shift registers. Shifting principle, Timing Diagram, SISO, SIPO, PISO and PIPO registers. 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 IC Logic Families: Properties DTL, RTL, TTL, 12 L

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:

- Digital Design, 3rd Edition, Moris M. Mano, Pearson Education.
- Fundamentals of digital circuits, 8th edition, A. Anand Kumar, PHI
- Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.
- Digital Electronics, G. K. Kharate, Oxford University Press.
- Digital Systems - Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.
- A First Course in Digital System Design: An Integrated Approach, India Edition, John P. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc.
- Digital Systems - Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.

Kinematics & Dynamics of Machines

RME4C001 Kinematics & Dynamics of Machines

Module - I : 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 : 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 : 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 : 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 : 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 and Mechanisms by John J. Uicker Jr., Gordon R. Pennock and Joseph E. Shigley, Oxford University Press
- 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,
- 3. Mechanism and Machine Theory by J.S.Rao and R.V.Dukipatti, New Age International.
- Theory of Mechanisms and Machines by A. Ghosh & A. K. Mallick, East West Press.
- 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.

Data Structure

RME4G003 Data Structure

Module - I 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 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 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 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 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:

- “Fundamentals of Data Structures”, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
- Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
- “How to Solve it by Computer”, 2nd Impression by R.G. Dromey, Pearson Education.

Engineering Thermodynamics

RME4C002 Engineering Thermodynamics

Module-I

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

Available energy, Quality of energy, Availability for non flow and flow process, Irreversibility, Exergy balance, Second law efficiency. General Thermodynamic property relations: The Maxwell relations, The Clapeyron equation, The TdS relations, Isothermal compressibility and volume expansivity, The Joule-Thomson coefficient.

Module- III

Vapour Power Cycles: The Carnot vapor cycle and its limitations, The Rankine cycle, Means of increasing the Rankine cycle efficiency, The reheat cycle, The regenerative feed heating cycle, Cogeneration (Back pressure and Pass-out turbines), Combined cycle power generation systems, Binary vapour cycles.

Module- IV

Gas Power Cycles: Air standard cycles- Otto, Diesel, Dual Combustion and Brayton cycles, The Brayton cycle with non-isentropic flow in compressors and turbines, The Brayton cycle with regeneration, reheating and intercooling, Ideal jet propulsion cycles. Refrigeration cycles: Reversed Carnot cycle, Reversed Brayton cycle (Gas refrigeration system), The vapor compression cycle, The vapor absorption cycle.

Module- V

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.Shaprio John Wiley & Sons

Microprocessor and Microcontroller

RME4G002 Microprocessor and Microcontroller

Module-I Introduction to 8 bit and 16 bit Microprocessors-H/W architecture

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.

Module -II 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 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 (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 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
- Microprocessors and Interfacing, Programming and Hardware, Douglas V Hall, TMH Publication, 2006.
- Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevananthan and S.K. Shah, Oxford University Press.
- The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.M C Kinlay, Pearson Education, Second Edition, 2008.
- Microcontrollers: Principles and Application, Ajit Pal, PHI Publication
- Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096, Krishna Kant, PHI Publication, 2007.
- Advanced Microprocessors and Peripherals, A.K. Ray, K M Bhurchandi, TMH Publication, 2007.
- Textbook of Microprocessor and Microcontroller, Thyagarajan, Scitech Publication.

Organisational Behaviour

ROB4E002 ORGANISATIONAL BEHAVIOUR

3 CREDITS

Module-I:

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:

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:

Foundations of Group Behavior: The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five - Stage Model of Group Development.

Managing Teams: Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

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:

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:

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

Introduction to Physical Metallurgy and Engineering Materials

RME4C003 Introduction to Physical Metallurgy and Engineering Materials

MODULE-I 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 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; recrystallization 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; order disorder transformation.

MODULE-III 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 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 Plastic-: Thermosetting and thermoplastics. Ceramics: Types, structure, Mechanical properties, application Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Fibre reinforced plastics, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite.

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

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