SYLLABUS

Semester 3

BBD UNIVERSITY

Babu Banarasi Das University

B Tech. CSE-AI

A.I. IN MECHANICAL ENGINEERING SYSTEM

Semester 3 Syllabus

MODULE 1

Definition of Artificial Intelligence, Mechanical Engineering System, Types of Mechanical Engineering Systems (MES), Machine learning (ML), Artificial Intelligence and Mechanical Engineering, Benefits of AI for Mechanical Engineering systems, Application of AI in MES.

MODULE 2

Basic Elements of an Automated System, Control Systems, Advanced Automation Functions, Levels of Automation, Sensors, Actuators, Analog–Digital Conversions, Input/output Devices for Discrete Data, Contact Input/output Interfaces.

MODULE 3

Expert System, Definition, Structure Characterization, Knowledge Sources, Expert Knowledge Acquisition, Expert System software for Mechanical Engineering application in CAD, CAPP, MRP, Adaptive Control. Robotics, process control. Typical cases for ML in Mechanical Engineering, Human-like machine vision, Adaptive control for process optimization.

MODULE 4

Application of Artificial Intelligence in Thermal Engineering, Artificial Intelligence in Additive Manufacturing, Artificial Intelligence in 3D printing, Application of Artificial Intelligence in Manufacturing.

Compiled by **Satyam Singh** and **Krishna Singh**

DISCRETE MATHEMATICS

Semester 3 Syllabus

MODULE 1

Set Theory, Relations, Functions & Natural Numbers

Set Theory: *Introduction, Combination of sets, Multisets, Ordered pairs, Proofs of some general identities on sets.*

Relations: *Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.*

Functions: *Definition, Classification of functions, Operations on functions.*

Natural Numbers: *Introduction, Mathematical Induction, Induction with Nonzero Base cases, Proof Methods, Proof by contradiction.*

MODULE 2

Groups, Rings, Fields and Lattice

Algebraic Structures: *Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Definition and elementary properties of Rings and Fields, Integers Modulo 'n'.*

Partial Order Sets: *Definition, Partial order sets, Combination of partial order sets, Hasse diagram.*

Lattices: *Definition, Properties of lattices, Bounded, Complemented, Modular, Complete lattice.*

MODULE 3

Proposition Logic

Propositional Logic: *Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference.*

Predicate Logic: *First order predicate-well-formed formula of predicate, quantifiers, Inference theory of predicate logic.*

Recurrence Relation & Combinatorics

Recurrence Relation & Generating function: *Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.*

Combinatorics: *Introduction, Counting Techniques: Pigeonhole Principle.*

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DIGITAL LOGIC DESIGN

Semester 3 Syllabus

MODULE 1

Digital Design and Binary Numbers: *Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes, Error Detecting and Correcting Codes, Hamming Codes. Min term and Max term Realization of Boolean Functions.*

Gate-level minimization: *The map method up to four variables, don't care conditions, SOP and POS simplification, NAND and NOR implementation, Quine Mc - Cluskey Method (Tabular method).*

MODULE 2

Combinational Logic: *Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Hazards and Threshold Logic.*

Memory and Programmable Logic Devices: *Semiconductor Memories, RAM, ROM, PLA, PAL, Memory System design.*

MODULE 3

Synchronous Sequential Logic: *Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure. Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.*

Asynchronous Sequential Logic: *Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, free state assignment ,hazards.*

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INDIAN CONSTITUTION

Semester 3 Syllabus

MODULE 1

Introduction to Indian Constitution

Constitution meaning of the term – The making of the Indian Constitution – Sources and constitutional history – Philosophy of Constituent Assembly – Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Union Government and its Administration Structure: President and Vice President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions.

MODULE 2

The States and The Union Territories

Government and its Administration: Governor – Role and Position – CM and Council of ministers, State Secretariat: Organisation, Structure and Functions – Relation between the Union and the States.

Local Administration

District's Administration Head – Role and Importance, Municipalities – Mayor and role of Elected Representative – Panchayati Raj: Functions PRI: Zilla Panchayat, Elected officials and their roles – Block level Organizational Hierarchy, Village level – Role of Elected and Appointed officials – Importance of grass-root democracy

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DATA STRUCTURE USING C

Semester 3 Syllabus

MODULE 1

Introduction

Introduction: *Basic Terminology, Data types and its classification, Algorithm complexity notations like big Oh, Time-Space trade-off. Abstract Data Type (ADT).*

Array: *Array, Definition, Representation and Analysis of Arrays, Single and Multidimensional Arrays, Address calculation, Array as Parameters, Sparse Matrices, Recursion - definition and processes, simulating recursion, Backtracking, Recursive algorithms, Tail recursion, Removal of recursion, Tower of Hanoi.*

MODULE 2

Stack and Linked List

Stack: *Stack, Array Implementation of stack, Linked Representation of Stack, Application of stack: Conversion of Infix to Prefix and Postfix Expressions And Expression evaluation, Queue, Array and linked implementation of queues, Circular queues, D-queues and Priority Queues.*

Linked List: *Linked list, Implementation of Singly Linked List, Two-way Header List, Doubly linked list, Linked List in Array. Generalized linked list, Application: Garbage collection and compaction, Polynomial Arithmetic.*

MODULE 3

Tree, Searching, Sorting and Hashing

Trees: *Basic, terminology, Binary Trees, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Binary Search Tree (BST), AVL Trees, B-trees.*

Applications: *Algebraic Expression, Huffman coding Algorithm. Internal and External sorting, Insertion Sort, Bubble Sort, selection sort, Quick Sort, Merge Sort, Heap Sort, Radix sort.*

Searching Hashing: *Sequential search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. Symbol Table, Static tree table, Dynamic Tree table.*

MODULE 4

Graphs: *Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal; Depth First search and B.F.S, Connected Component, Spanning Trees, Minimum Cost Spanning Trees; Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm; Warshall Algorithm and Dijkstra Algorithm.*

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