MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR - 474005

(A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal, M.P.)

NAAC Accredited with A++ Grade

Syllabi of
Departmental Courses (DC) Courses
B.Tech IV Semester
(Computer Science and Design)
Under Flexible Curriculum

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Department of Computer Science and Engineering

Web Technologies

DC-2290401

COURSE OBJECTIVES

- To learn about the communication model and web architecture.
- To impart the design, development and implementation of Web Pages.
- To develop programs for Web using Scripting Languages.

Unit – I:

Introduction to the Internet: The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, Domains, Protocols, Hypertext Transfer Protocol, Internet Protocol, IP address, MAC Address, 3-Tier web architecture, Brief Overview of OSI models, web browser, Static and Dynamic web pages.

Unit – II:

HTML: Basic Syntax of HTML, Elements, Attributes, heading, paragraph, styles, formatting, commnts, colors, links, images, tables, lists, forms, media.

Unit – III:

Cascading Style Sheets: Introduction to CSS, Syntax, Selectors, Box Model, Inline, internal and External CSS, colors, borders, margin, padding z-index.

Unit – IV:

The Basics of JavaScript: Introduction to javascript, syntax, comments, variables, constants, operators, data types ,objects, strings, arrays, if else, switch, loops, function.

Unit – V:

PHP&MYSQL: Introduction to php, syntax, comments, variables, echo, datatypes, strings, operators, if else, switch, loops, function, arrays, Introduction to MySQL, clauses and simple query using select, where, order by, min max, count, avg, sum, like, alias, in.,How to create website using menu icon, tabs, navigations, search bar etc.

RECOMMENDED BOOKS

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. Web Technologies, Black Book, dreamtech Press
3. Web Technologies, Achyut Godbole, Atul Kahate, Tata McGraw-Hill
4. Principles of Web Design, Joel Sklar, Cengage Learning

COURSE OUTCOMES

After completion of this course, the students would be able to:

1. **Distinguish** among various web designing technologies for website development
2. **Construct** webpages using HTML and CSS
3. **Model** website using JavaScript and PHP
4. **Design** Static and Dynamic website
5. **Explain** the working of web pages and data retrieval

Department of Computer Science and Engineering
Microprocessor Design
DC-2290402

COURSE OBJECTIVES

- To provide the fundamental concepts and principles of microprocessor.
- To know about the importance of multiprocessor and multi-computers.
- Practical exposure of 8085 microprocessor through Assembly Language.
- Explore different IOT based programming strategies such as, arduino , Rasberry Pi, etc.

Unit -I

Technological trends, measuring performance: MIPS, CPI/IPC, Benchmark suite, Geometric and Arithmetic means, Speed up, Amdahl's law, Introduction to Microprocessor Systems, Historical development, Basic architecture and components, Overview of different microprocessor families, Microprocessor vs. Microcontroller.

Unit- II

Introduction of 8085 Microprocessor: Architecture of 8085 processor. Register Architecture: Accumulator, Temporally Register and Flag Register. Program Counter, Stack pointer and Instruction register. Addressing Modes: Direct addressing mode and Register direct Addressing Mode. Register Indirect Addressing Mode, Immediate Addressing Mode and Implicit or Implied Addressing Mode.
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Unit -III

Introduction to Assembly Language Programming: Various Instructions Classifications: Instruction Format, Opcode, Operand and Hex code. Instruction Operation Status, Various Instruction Sets: Data Transfer Group Instructions, Arithmetic Group Instructions, Logical Group Instruction, Branch Group Instructions: Conditional and Unconditional and Machine control Instructions.

Unit -IV

Parallel Computing: Flynn's Classification of Computer Architecture, Types of Parallelism, Parallel programming models. Multi processors and multi computers, Shared memory organization-Interleaved memory organization, CISC and RISC scalar processors-Super scalar processors-VLIW architecture- Multivector and SIMD computers.

Unit-V

Understanding IoT fundamentals, IoT architectures and protocols, Working of sensors and actuators, , Sensor Networks, Machine-to-Machine Communications, Interfacing with Arduino and programming, Raspberry Pi integration and programs, NVIDIA Jetson Nano (GPU) etc., Cloud platform for IoT, IoT Applications.

RECOMMENDED BOOKS

- "Microprocessor Architecture, Programming, and Applications with the 8085" by Ramesh S. Gaonkar.
- "Internet of Things (IoT): A Hands-On Approach" by Arshdeep Bahga and Vijay.
- “Raspberry Pi Cookbook” by Simon Monk.
- "Parallel Programming in C with MPI and OpenMP" by Michael J. Quinn
- "Parallel Computer Architecture: A Hardware/Software Approach" by David E. Culler, Jaswinder Pal Singh, and Anoop Gupta.
- "High-Performance Computer Architecture" by Harold S. Stone

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COURSE OUTCOMES

After completion of the course students would be able to:

1. **Apply** suitable assembly code for different problems.
2. **Apply** and Understand Assembly Language Instructions.
3. **Analyse** the metrics for measuring microprocessor performance.
4. **Compare** and classify the instruction set of 8085/8086 microprocessor.
5. **Evaluate** the architecture and organization of 8085/8086 microprocessor.

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Department of Computer Science and Engineering

Optimization Techniques

DC-2290403

COURSE OBJECTIVES:

- Understand the role of optimization in engineering applications.
- Define optimization problems and emphasize the importance of clear problem statements.
- Categorize optimization problems based on their characteristics and constraints.
- Differentiate between global and local optima and their implications in optimization.
- Explore concepts related to optimal design and their significance in engineering.

Unit 1: Introduction to Optimization

Overview of Optimization: Understanding the role of optimization in engineering applications. Problem Formulation: Defining optimization problems, emphasizing the importance of clear problem statements. Classification: Categorizing optimization problems based on their characteristics and constraints.

Unit 2: Optimum Design

Optimal Design Concepts: Exploring concepts related to optimal design and their significance in engineering. Global vs. Local Optima: Differentiating between global and local optima, and their implications in optimization. Optimality Criteria: Introduction to criteria used to evaluate optimality, ensuring a comprehensive understanding. Basic Calculus Review: Revisiting fundamental calculus concepts relevant to optimization problems. Global Optimality: Examining the concept of global optimality and its application in engineering scenarios.

Unit 3: Linear Programming

Introduction to linear programming (LP), Formulation of linear programming problems, Graphical method for solving two-variable LP problems, Matrix notation and operations, Vector spaces and linear independence

Unit 4: Optimization Algorithms for Unconstrained and Constrained Optimization Problems

The distinction between constrained and unconstrained optimization. Basics of Gradient Descent: Introduction to gradient-based optimization, Gradient Descent algorithm. Steepest Descent: Understanding the steepest descent method, Comparison with traditional gradient descent, Applications and limitations. Newton's Method: Second-order optimization with Newton's method, Hessian matrix and convergence analysis.

Unit 5: Modern Methods of Optimization

Genetic Algorithms: Introduction to genetic algorithms and their role in optimization. Simulated Annealing: Exploring the principles and applications of simulated annealing in optimization problems. Ant Colony Optimization: Understanding the concepts and applications of ant colony optimization.Fuzzy Optimization Techniques: Introduction to fuzzy optimization techniques and their practical applications.

RECOMMENDED BOOKS:

- Jorge Nocedal , Stephen J. Wright: Numerical Optimization.
- Andreas Antoniou, Wu-Sheng Lu: Practical_Optimizatopn
- Stephen Boyd, and Lieven Vandenberghe: Convex Optimization

COURSE OUTCOMES:

After completing this course, the students will be able to:

1. **Describe** fundamental concepts of optimization, including its role in engineering applications.
2. **Describe** a clear understanding of the importance of formulating optimization problems.
3. **Apply** their knowledge by classifying optimization problems, formulating linear programming problems.
4. **Analyze** optimization algorithms such as gradient descent, steepest descent, Newton's method, and direct methods for constrained optimization.
5. **Differentiate** between global and local optima, evaluating optimality criteria.
6. **Evaluate** optimization methods, comparing their efficiency, limitations, and practical applications.

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Department of Computer Science and Engineering

THEORY OF COMPUTATION

2290404 (DC)

COURSE OBJECTIVE

- To understand computability, decidability, and complexity through problem solving.
- To analyse and design abstract model of computation & formal languages
- To understand and conduct mathematical proofs for computation and algorithms.

Unit-I

Introduction to Theory of Computation: Automata, Computability and Complexity, Alphabet, Symbol, String, and Formal Languages, Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and Mealy machines, Composite Machine, Conversion from Mealy to Moore and vice versa.

Unit-II

Types of Finite Automata: Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Pumping lemma, applications, Closure properties of regular languages, 2 way DFA.

Unit-III

Grammars: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, Rightmost and Leftmost derivations of Strings, ambiguity in grammar, simplification of context free grammar, killing null and unit productions, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar,. Chomsky Normal Form (CNF) and Greibach Normal Form (GNF).

Unit-IV

Push down Automata: Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack, Example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA.

Unit-V

Turing Machine: Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability and

Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem (PCB).

RECOMMENDED BOOKS

- Introduction to Automata Theory Language & Computation, Hopcroft& Ullman, Narosa Publication.
- Element of the Theory Computation, Lewis &Christors,Pearson.
- Theory of Computation, Chandrasekhar &Mishra,PHI.
- Theory of Computation, Wood, Harper &Row.
- Introduction to Computing Theory, Daniel I-A Cohen,Wiley.

COURSE OUTCOMES

After completion of this course, the students would be able to:

1. **Describe** the basic concepts of switching and finite automata theory & languages.
2. **Compute** abstract models of computing and check their power to recognize the languages.
3. **Analyze** the grammar, its types, simplification and normal form.
4. **Design** mathematical models to prove properties of languages, grammars and automata.
5. **Apply** automata theory, languages and computation in engineering application.

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Department of Computer Science and Engineering

COMPUTER NETWORKS
2290405 (DC)

COURSE OBJECTIVES

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

Unit-I

Introduction: Computer Network, Types- LAN,MAN&WAN,Data transmission modes- Serial & Parallel, Simplex, Half duplex & full duplex, Synchronous & Asynchronous transmission, Transmission medium- Guided & Unguided, Cables- Twisted pair, Coaxial cable & Optical fiber, Networking devices-Repeaters, Hub, Switch, Bridge, Router, Gateway, Modem, Proxy Server, Wireless router, & Wireless Access Point (WAPs). Performance Criteria- Bandwidth, Throughput, Latency (Delay), Propagation Time, Transmission time & Queuing Time, Network Standardization- OSI Reference Model & TCP/IP Reference Mode.

Unit-II

Physical Layer: Network topologies- Bus, Ring, Star Topology & Mesh, Switching- Circuit switching, Message switching & Packet switching, Multiplexing; FDM – Frequency division multiplexing, WDM – Wavelength division multiplexing & TDM – Time division multiplexing, Wireless transmission- Electromagnetic spectrum, Radio transmission & Microwave transmission.

Unit-III

Data Link Layer: Introduction, Design issues, Services, Framing, Error control, Flow control, ARQ Strategies, Error Detection and correction, Parity bits, Cyclic Redundant Code (CRC), Hamming codes, MAC Sub Layer- The channel allocation problem, Pure ALOHA ,Slotted ALOHA, CSMA ,CSMA/CD,CSMA/CA,IEEE 802.3 frame format.

Unit-IV

Network Layer& Transport Layer: Introduction, Design issues, Services, Routing- Distance vector routing, Hierarchical routing , Link state routing, Shortest path algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Flooding, Congestion Control- Open Loop & Closed Loop Congestion Control, Leaky Bucket & Token bucket Algorithm. Connection Oriented & Connectionless Service, Port addressing basics.

Unit-V

Presentation, Session& Application Layer: Introduction, Design issues, Presentation layer- Translation, Encryption & Compression. Session Layer – Dialog Control, Synchronization. Application Layer- Remote login, File transfer & Electronic mail.

RECOMMENDED BOOKS

- Behrouz A. Forouzan "Data Communication and Networking", McGraw – Hill Publications.
- Andrew Tanenbaum – Computer Networks, PHI
- Peterson and Davie, "Computer Networks, A systems Approach", 5th ed., Elsevier, 2011.
- Ying-Dar Liu, Ren-Hwang, Fred Baker, "Computer Networks: An open Source Approach", McGraw – Hill, 2001.

COURSE OUTCOMES

After completion of the course students would be able to:

1. **Categorizing** the components of data communication system
2. **Illustrate** the different types of network topologies, protocols, networks devices, transmission media
3. **Evaluate** channel allocation, framing, Error and flow control techniques.
4. **Describe** the functions of Network Layer and Transport Layer functions.
5. **Elaborate** the functions offered by session, presentation, and application layer and their Implementation.

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Department of Computer Science and Engineering

PROGRAMMING LAB. (ROBOTICS AND AUTOMATION)

2290406(DLC)

COURSE OBJECTIVES

- To provide the fundamental concepts and principles of digital electronics and its components.
- To know about the importance of sensors and actuators in IOT.
- Practical exposure of robotics and automation using arduino, raspberry Pi, etc.
- Explore the fundamentals of robotics along with various robot navigation and localization techniques.

Unit -I

Introduction to Arduino & IOT: Setup the IDE, Arduino Software ,Arduino Libraries, Basic programming for Arduino, Analog input and analog output on Arduino Mega board using PWM ,Interfacing LED, push button and buzzer with Arduino ,Interfacing Arduino with LCD, Understanding IoT fundamentals, IOT Architecture and protocols, Understanding Rasberry Pi and Jetson nano.

Unit- II

Introduction to Robotics: Robot-Basic concepts, Need, Law, History, Anatomy, specifications, End effectors-Classification, Types of Mechanical actuation, Gripper design, Robot drive system Types, Position and velocity feedback devices-Robot joints and links-Types, Motion interpolation.

Unit -III

Robotic Sensors & Actuators: Overview of Sensors working , Analog and Digital Sensors, Interfacing of Temperature and Humidity, IR and Ultrasonic sensors, Motion Sensor, Lidar, Gyroscope, Magnetometer, Camera and Color sensor, Interfacing of Relay Switch and Servo Motor, DC Motor Control, Stepper Motor Control, Gear Motor, Kinematics of Robotic Arms, Computer Vision in Robotic Arms, Object Recognition and Tracking

Unit -IV

Fundamentals of Robotics: Types and Applications of Robots, Control Systems in Robotics, Kinematics and Dynamics, Robot Localization: Odometry-Based Localization, Beacon-Based

Localization, Map-Based Localization, Grid-Based Localization, Robot Navigation: Path Planning, Local Navigation, Collision Avoidance, SLAM-Based Navigation.

Unit-V

Application of Industrial Automation: Smart Metering, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Health and Safety Monitoring Smart Cards, Plant Automation, Real life examples of IIOT in Manufacturing Sector.

RECOMMENDED BOOKS

- "Internet of Things (IoT): A Hands-On Approach" by Arshdeep Bahga and Vijay.
- “Raspberry Pi Cookbook” by Simon Monk.
- "Introduction to Autonomous Robots" by Nikolaus Correll
- "Robot Dynamics and Control" by Mark W. Spong
- "Industry 4.0: The Industrial Internet of Things" by Alasdair Gilchrist

COURSE OUTCOMES

After completion of the course students would be able to:

1. **Implement** arduino programming code for different problems.
2. **Analyze** and understand fundamental of robotics.
3. **Explore** the integration of different sensor and actuators.