# SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
## DEPARTMENT OF COMPUTER ENGINEERING
### M.TECH I$^{st}$ YEAR (4YDC)
### SEMESTER - A
### July-Dec2023
### CO71016: PROGRAMMING SYSTEMS

**COURSE OBJECTIVES:**
To provide a comprehensive skill for problem solving using the programming system.

**COURSE OUTCOMES:**
**After completing the course student should be able to:**

1. Develop ability to write a computer program to solve specified problems.
2. Develop skills in algorithmic problem-solving, expressed in a programming language like C, C++, python, Java.
3. Write and document the industry ready program.
4. Solve the real world business problems using programming system.

**Lecture Plan**

| Sr. No. | Topics Covered | No. of lectures |
|---|---|---|
| **L1.** | Programming Systems Introduction and Objectives | **1** |
| **L2.** | Flow charts, algorithms, Computer programming languages | **1** |
| **L3.** | Keywords, variables & data types | **1** |
| **L4.** | Structure of Program | **1** |
| **L5.** | Programming Statements | **1** |
| **L6.** | Input/output and formatting | **1** |
| **L7.** | Loops & Decision making | **1** |
| **L8.** | Arrays and memory allocation | **1** |
| **L9.** | Operators and it’s arithmetic | **1** |
| **L10.** | Functions | **1** |
| **L11.** | Recursion | **1** |
| **L12.** | Structures & Unions | **1** |
| **L13.** | Pointers Concepts | **1** |
| **L14.** | Pointers Application | **1** |
| **L15.** | File handling | **1** |
| **L16.** | String & it's operations | **1** |

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|---|---|---|
| **L17.** | STL and Components of STL | **1** |
| **L18.** | STL Containers | **1** |
| **L19.** | STL Iterators | **1** |
| **L20.** | Boots libraries | **1** |
| **L21.** | STL/Boots Libraries applications | **1** |
| **L22.** | Coding standards | **1** |
| **L23.** | Code tuning techniques | **1** |
| **L24.** | Version controlling: Gits | **1** |
| **L25.** | Version controlling: CVC | **1** |
| **L26.** | Error and it's types | **1** |
| **L27.** | Error handling: debugging | **1** |
| **L28.** | Code profiling | **1** |
| **L29.** | Introduction to coding documentation | **1** |
| **L30.** | LaTex and Bibtex | **1** |
| **L31.** | Introduction to object oriented Programming | **1** |
| **L32.** | Object and Class | **1** |
| **L33.** | Object oriented design principles: encapsulation | **1** |
| **L34.** | Object oriented design principles: information hiding | **1** |
| **L35.** | Object oriented design principles: inheritance | **1** |
| **L36.** | Object oriented design principles: Polymorphism | **1** |

# SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
## DEPARTMENT OF COMPUTER ENGINEERING
### M. TECH. I YEAR (2YDC)
### SEMESTER-A
### July-Dec 2023
### CO71017: MODERN COMPUTER NETWORKS

**COURSE OBJECTIVES:**
To enable student in understanding networks, its challenges and various solutions.

**COURSE OUTCOMES:** After completing the course student should be able to:
1. Identify errors in a network and able to debug these networking errors.
2. Apply various protocols and algorithms to design and implement a computer network.
3. Estimate the performance of various networking devices and can argue on efficiency related issues.
4. Identify various challenges of the implemented network and can present optimized solutions for those challenges.

| Sr. No. | Topics Covered | No. of lectures |
|---|---|---|
| 1 | UNIT 1<br>Introduction to computer networks & their uses, Different topologies. | 2 |
| 2 | ISO-OSI model: Layered Architecture, Peer-to-Peer processes and encapsulation, Function and Services of OSI layers | 2 |
| 3 | The Physical layer: Digital Signals, Transmission Impairments and Maximum data rate of a channel | 1 |
| 4 | Shannon's theorem, Nyquist theorem. Circuit, Packet and Message switching, virtual Circuit | 1 |
| 5 | Error detection & correction, Hamming code & CRC codes, Framing: Fixed size and Variable size Frame, Bit stuffing and Byte stuffing | 2 |
| 6 | The data link layer: Design issues & function. | 1 |
| 7 | Data link layer protocols: Simplest, Stop and Wait, Sliding window protocols, | 1 |
| 8 | The medium access sublayer: Static and Dynamic Channel Allocation, Protocols: ALOHA Protocol, CSMA (CSMA/CD, CSMA/CA) | 2 |
| 9 | UNIT 2 IEEE 802.3, LAN Devices: HUB, Switches- Learning, Cut-Through and store and forward switches. | 2 |
| 10 | Internetworking Devices: Routers & gateways | 1 |
| 11 | The network layer: Design issues and functions, TCP/IP Protocol Architecture: ARP/RARP | 1 |
| 12 | IP addressing, IP Datagram format and its Delivery, Routing table format | 2 |

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| 13 | UNIT 3 IPv4 fragmentation, Subnet, Supernet, CIDR. Different ICMP messages | 1 |
| 14 | Routing algorithms, BGP, Different messages of BGP. Interior Gateway protocol: RIP, OSPF | 2 |
| 15 | UNIT 4 Transport layer:<br>Multiplexing and ports, TCP: Segment format, Sockets, Synchronization, | 2 |
| 16 | Three Way Handshaking, Variable window size and Flow control, Timeout and Retransmission algorithms | 1 |
| 17 | Connection Control, Silly window Syndrome | 1 |
| 18 | UDP: Message Encapsulation, Format and Pseudo header. Wireless LAN: Transmission Medium For WLANs, | 1 |
| 19 | MAC problems, Hidden and Exposed terminals, Near and Far terminals, Infrastructure and Ad hoc Networks, IEEE 802.11. | 2 |
| 20 | Physical layer, Concept of spread spectrum, MAC and its management, Power management. | 2 |
| 21 | UNIT 5<br>Mobile IP: unsuitability of Traditional IP; Goals, Terminology, Agent advertisement and discovery, Registration | 1 |
| 22 | Tunneling techniques. Ad hoc network routing: Ad hoc Network routing v/s Traditional IP routing | 1 |
| 23 | OADV, DSDV, DSR, ZRP routing protocols. | 2 |
| 24 | Mobile Transport Layer: unsuitability of Traditional TCP; I-TCP, S-TCP, MTCP | 2 |
| | **Total Lectures** | **35** |

**SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE**
**DEPARTMENT OF COMPUTER ENGINEERING**
**M.TECH I YEAR (2YDC)**
**SEMESTER-A**
**July-Dec 2023**
**CO71018: Advances in Operating Systems**

**COURSE OBJECTIVES:** To enable a student in high level understanding of advanced operating systems and their applications in diverse domains.

**COURSE OUTCOMES:**

After completing the course student should be able to:
1. Demonstrate understanding of design issues of advanced operating systems and Compare different types of operating systems.
2. Analyze design aspects for different subsystems of diverse Operating Systems.
3. Compare & Contrast different architectures used in Distributed Operating Systems
4. Analyze synchronization amongst various components of a typical operating system.

# Lecture Plan

| Lecture | Topics |
|---|---|
| | Need/importance and Scope of subject. |
| | Review of Operating System Fundamentals; Different Types of O/S. |
| | Different Types of O/S; Dedicated Operating Systems. |
| | The Genesis of Modern Operating Systems; Operating Systems Design Strategies. |
| | Kernel Architectures– Microkernels, Exokernels etc. |
| | Operating Systems Services. |
| | System Calls and their Implementation. |
| | System Calls and their Implementation. |
| | **Quiz - I** |
| | File Systems: File Concept, Different Modules of a File System. |
| | Review of Disk Space Allocation Algorithms. |
| | File Protection; Disk Partitioning. |
| | Kernel I/O Subsystem. |
| | Advancements for improving File System Performance. |
| | System Calls for File Systems Management. |
| | System Calls for File Systems Management. |
| | System Calls for File Systems Management. |
| | **Mid Term Test - I** |
| | Review of Main Memory Management Techniques- Contigous Allocation. |
| | Review of Main Memory Management Techniques- Non Contigous Allocation: PAGING and Segmentation; Virtual Memory. |

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| | Process Management: Review of Process and Scheduling Concepts. |
| | CPU Scheduling Algorithms. |
| | System Calls for Process Management. |
| | System Calls for Process Management. |
| | System Calls for Process Management; IPC. |
| | **Quiz - II** |
| | Concept of Threads: Process v/s Threads; User Level & Kernel Level Threads. |
| | Threads Scheduling, Threading Issues. |
| | Solutions to Critical Section Problem and Synchronization for Threads. |
| | Scheduling in Multi-core Systems; Concept of Load Balancing. |
| | Load Balancing Techniques for Multicore and Multiprocessor systems. |
| | Dynamic Load Balancing, Process Migration. |
| | **Mid Term Test- II** |
| | Distributed Operating Systems: Design Issues. |
| | Overview of Distributed File Systems. |
| | Overview of Distributed Process Management, Distributed Memory Management. |
| | Embedded and IoT Operating Systems: Introduction. |
| | Embedded and IoT Operating Systems: Characteristics and Features. |
| | Challenges and Issues in Designing the Operating Systems for Resource Constrained Systems. |
| | **Quiz - III** |
| | Virtualization: Basic Concepts, Benefits and Features; Virtualization Building Blocks. |
| | Virtualization and O/S Components, Hypervisors. |
| | Virtual Machines, CPU and Memory Virtualization. |
| | Case Studies: Unix/Linux, Windows and Contemporary Embedded Operating Systems like Embedded Linux. |
| | Case Studies: Unix/Linux, Windows and Contemporary Embedded Operating Systems like Embedded Linux. |
| | Case Studies: Unix/Linux, Windows and Contemporary Embedded Operating Systems like Embedded Linux. |
| L 42. | Study of Source Code of Open Source Operating System like Linux. |
| L 43. | Study of Source Code of Open Source Operating System like Linux. |
| | **Mid Term Test- III** |
| L 44. | Old Exam Paper Discussion – I |
| L 45. | Old Exam Paper Discussion – II |

# SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
## DEPARTMENT OF COMPUTER ENGINEERING
### M.TECH. I YEAR (2YDC)
### SEMESTER-A
### July-Dec 2023
### CO 71211: Machine Learning

**COURSE OBJECTIVES:**

**1.** To understand the various methods and algorithms in machine learning.
**2.** To analyse different hyperparameters of machine learning algorithms.
**3.** To analyse the real world problem and find the feasibility of applying a machine learning algorithm to it.
**4.** Apply machine learning algorithm to it.

**COURSE OUTCOMES:**

**After completing the course student should be able to:**

1. Describe in-depth about theories, methods, and algorithms in machine learning.
2. Find and analyze the optimal hyper parameters of the machine learning algorithms.
3. Examine the nature of a problem at hand and determine whether a machine learning can solve it efficiently enough.
4. Solve and implement the real world problems using machine learning.

**Lecture Plan**

| Sr. No. | Topics Covered | No. of lectures |
|---|---|---|
| **1** | CO's, Assessment policies, Scope of subject, What is covered? And what is not covered? Introduction to machine learning, Basics of ML, History of ML, Evolution of ML | **1** |
| **2** | Types of Machine Learning- Supervised, Unsupervised, Reinforcement, Semi-Supervised, Generative Adversarial Networks. | **1** |
| **3** | Linear regression, intuition, mean squared error cost function. | **1** |
| **4** | Gradient Descent algorithm, R-squared, adjusted R-squared. | **1** |
| **5** | Underfitting, Overfitting, Bias variance trade-off,Hold out Methods, Applications of Machine Learning, ML Tools. | **1** |
| **6** | Logistic regression algorithm, binary cost entropy cost function, sigmoid activation function, confusion matrix, ROC-AUC curve . | **1** |
| **7** | Multinomial Logistic regression, softmax activation function, cost entropy cost function. | **1** |
| **8** | Introduction to Artificial Neural Network, Biological neuron. | **1** |
| **9** | McCulloch Pitts Neuron models, implementing different logical gates using McCulloch Pitts Neuron. | **1** |

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| **10** | Activation Functions, Loss Functions. | **1** |
| **11** | Perceptron, Multilayer neural networks. | **1** |
| **12** | Gradient Descent, Momentum Based, Nesterov, Mini-Batch, Stochastic, Adaptive learning. | **1** |
| **13** | AdaGrad, RMSProp, Adam, comparison between all variants of GD | **1** |
| **14** | Sigmoid neuron, Back-propagation algorithm, | **1** |
| **15** | Back-propagation calculus, initialization,Training rules of Back propagation, issues in back-propagation. | **1** |
| **16** | Bayesian Learning, naive bayes classifier | **1** |
| **17** | Competitive learning,Self-organization map. | **1** |
| **18** | Introduction to Convolutional Neural network - motivation behind it, its applications. | **1** |
| **19** | Working of CNN- convolution layer, padding, pooling, stride, AlexNet. | **1** |
| **20** | Introduction to Support Vector Machines, SVM Formulation, Interpretation & Analysis. | **1** |
| **21** | Margin, Hyperplane, Support vector. | **1** |
| **22** | Hard and soft margin, Hinge loss, SVM dual,SVM Kernels. | **1** |
| **23** | Clustering, distance measures, types of Clustering- Partitional, Hierarchical, Density Based. | **1** |
| **24** | K-Means Clustering, Elbow method, Mean Shift Clustering. | **1** |
| **25** | Agglomerative clustering, Dendrograms, Single Linkage, Multiple Linkage, Average Linkage. | **1** |
| **26** | Density-based Clustering- DBSCAN, core, border, noise points. | **1** |
| **27** | Cluster validity, scatter Coefficient, silhouette coefficient. | **1** |
| **28** | Association Rule Mining,Gaussian Mixture Models, Expectation Maximization. Parameters estimations – MLE, MAP. | **1** |
| **29** | Probably Approximately Correct (PAC) Model, PAC Learnability. | **1** |
| **30** | Agnostic PAC Learning,Generalization error bounds, VC Model. | **1** |