MAHATMA GANDHI INSTITUTE OF TECHNOLOGY

(Autonomous)
Gandipet, Hyderabad – 500 075

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

List of Open Electives Offered by Computer Science and Engineering Department to CSB, CSD and CSM branches under MR-21 Regulation

VI Semester Open Elective-I for CSB, CSM and CSD branches

S,No	Code	Name of the Course
1	CS631OE	Data Structures
2	CS632OE	Operating Systems
3	CS633OE	Database Management Systems

VII Semester Open Elective-II for CSB, CSM and CSD branches

S,No	Code	Name of the Course
1	CS731OE	Computer Networks
2	CS732OE	Software Engineering
3	CS733OE	Java Programming

VIII Semester Open Elective-III for CSB, CSM and CSD branches

S,No	Code	Name of the Course
1	CS831OE	Python Programming
2	CS832OE	Internet of Things
3	CS833OE	Introduction to Machine Learning

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Open Elective for other Departments
VI Semester Syllabus
CS631OE : Data Structures
(Open Elective-I)
(Common to CSB, CSM & CSD)

Prerequisites: Any programming language

Course Objectives:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as trees and graphs
- Understand the concepts of heaps and tries.
- Introduces sorting and pattern matching algorithms.

Course Outcomes:

Student will be able to:

- Understand basic data structures such as arrays, linked lists, stacks and queues.
- Describe the hash function and concepts of collision and its resolution methods.
- Understand, design and implement the general tree data structures with their applications.
- Solve problem involving graphs, trees and heaps.
- Implement and know the application of algorithms for sorting and pattern matching

Unit I :

Introduction: Data structures-definition and types, Static and Dynamic representation of data structure and comparison. **Stack:** definition, operations on stacks, Notations- Infix, Prefix and Postfix representation. Infix to Postfix conversion example. Evaluation of Postfix expression example.

Unit II :

Hashing: Hash Functions, collision resolution techniques- Separate Chaining, Open Addressing-Linear probing, Quadratic Probing, Double Hashing. Rehashing, Extensible Hashing.

Dictionaries: Linear list representation, skip list representation, operations - insertion, deletionand searching.

Unit III :

Trees: Basic terminology, Types of trees: Binary Tree, Complete and Full Binary Tree, Extended Binary Trees, Threaded Binary Trees. **Search Trees**: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, Splay Trees-Insertion.

Unit IV:

Graphs-Basic terminology, Representation of graphs, **Graph Traversals**-Breadth First Search, Depth First Search with algorithms. **Sortings**: Heap Sort, External Sorting- Model for external sorting, Merge Sort.

Unit V:

Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moorealgorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries

Text Books:

1. Horowitz and Sahani, Fundamentals of Data Structures, Galgotia Publications Pvt LtdDelhi India.
2. Aaron M. Tenenbaum,Yedidyah Langsam and Moshe J. Augenstein, Data StructuresUsing C and C++, PHI Learning Private Limited, Delhi India.

Reference Books:

1. Richard F.Gillberg & Behrouz A. Forouzan, Data Structures, A Pseudo code Approachwith C, Second Edition, Cengage Learning, India Edition, 2005.
2. Aaron M. Tenenbaum,Yedidyah Langsam and Moshe J. Augenstein, Data StructuresUsing C and C++, PHI Learning Private Limited, Delhi India.
3. Seymour Lipschutz, Schaum's Outlines, Data Structures, Special Second Edition,TataMcGraw-Hill,.

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Open Elective for other Departments
VI Semester Syllabus
CS632OE: Operating Systems
(**Open Elective-I**)
(Common to CSB, CSM & CSD)

Course Objectives:

- To understand the OS role in the overall computer system and study different OS and compare their features.
- To understand the scheduling policies of OS and introduces system call Interface for process management.
- To understand process concurrency and synchronization.
- To understand the different memory management techniques.
- To understand the concepts of input/output, file management and Introduces system call for file management.

Course Outcomes:

- Define the fundamental components of a computer operating system and the interactions among them.
- Analyse the performance of CPU scheduling algorithms.
- Ability to design and solve synchronization problems using semaphores and monitors.
- Illustrate memory management techniques and deadlock handling methods.
- Ability to change Access control to protect files

Unit – I

Operating System – Introduction: Operating system objectives, User view, System view,Operating system definition, Computer System Architecture, OS Operations, **System Structures**: Operating System services, System Calls, Types of System Calls, System Programs, OS Structure.

Unit – II

Process and CPU Scheduling –Process concept**:** The Process, Process State, PCB, Threads. Process Scheduling-Scheduling Queues, Schedulers, Context Switch, and Operations on Processes.
Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems using pipes, FIFOs, message queues, shared memory. System call interface for process management-fork(), exit(), wait(), waitpid(), exec().

Unit – III

Process Management and Synchronization - The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Monitors.
Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks,Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

Unit – IV

Memory Management and Virtual Memory: – Memory Management Strategies- Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual Memory Management-Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms-FIFO, Optimal, LRU, Allocation of Frames, Thrashing.

Unit – V

File System Interface and Operations - Access methods, Directory Structure, Protection, FileSystem Structure, Allocation methods, Free-space Management.

System Calls-Usage of open(), create(), read(), write(), close(), lseek(), stat(), ioctl() systemcalls.Study of Different Operating Systems: Windows, Unix and Android.

Text Books

1. Abraham Silberchatz, Peter B. Galvin ,Operating System Principles-, Greg Gagne 9thEdition, John Wiley, 2014.
2. Operating Systems – Internals and Design Principles, W. Stallings, 7th Edition, Pearson,2012.

Reference Books

1. Crowley, TMH, Operating System A Design Approach-
2. Andrew S, Modern Operating Systems, Tanenbaum 2nd edition, Pearson/PHI W.R. Stevens, Advanced programming in the UNIX environment, Pearson education.
3. Operating Systems-A Concept based Approach by Dhamdhere, TMH, 2nd Edition.

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Open Electives for other departments

VI Semester Syllabus
CS633OE: Database Management Systems
(Open Elective -I)

(Common to CSB, CSM and CSD)

Prerequisites: Data structures

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To apply the concurrency control, recovery, and indexing for the real time data
- To become familiar with database storage structures and access techniques

Course Outcomes:

- Design a database using ER modelling.
- Develop complex queries using SQL.
- Apply normalization techniques on databases.
- Explain the ACID properties of transactions and apply the serializability tests.
- Solve problems using various indexing and hashing techniques.

Unit I

Introduction: Purpose of Database Systems, View of Data, Database Languages, Database Models, Database Architecture, Database System Applications.

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

Unit II

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data

SQL: Queries, Constraints, Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Introduction to Views.

Unit III

Functional Dependencies -Introduction, Basic Definitions, Trivial, Non-Trivial functionaldependencies, Closure of set of dependencies, Closure of Attributes

Schema Refinement: Problems caused by redundancy, decompositions, Properties of decomposition, Normalization-FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

Unit IV

Transaction Management and Recovery: Transaction Concept, Transaction State,Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols.

Unit V

Storage and Indexing: Data on External Storage, File Organization and Indexing, ClusterIndexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure-Insertion, Deletion and Searching.

Text Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Data base Management Systems, , McGraw HillEducation (India) Private Limited, 3rd Edition.
2. A. Silberschatz, Henry. F. Korth, S. Sudarshan, Data base System Concepts, McGrawHill Education (India) Private Limited, 6th edition.

REFERENCE BOOKS:

1. R Elmasri, ShamkantB.Navathe, Database Systems, 6th edition, Pearson Education.
2. M. L. Gillenson and others, Introduction to Database Management, Wiley StudentEdition.
3. C. J. Date, Database Development and Management, Introduction to Database Systems,Pearson Education.

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Open Elective for other departments
VII Semester Syllabus
CS731OE: Computer Networks
(Open Elective - II)
(Common to CSB, CSM and CSD)

Course Objectives:

- Familiarize the knowledge of the functions of each layer in the OSI and TCP/IPreference model.
- Identify the Error detection and correction techniques in Data Link Layer.
- Analyze the knowledge of routing algorithms.
- Understand the connection management of TCP&UDP Protocols.
- Ability to understand the concepts of DNS & Electronic Mail.

Course Outcomes: On successful completion of the course, the student will:

- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Gain the knowledge of Error detection and correction techniques.
- Gain the knowledge of routing algorithms.
- Gain the knowledge of TCP&UDP connection management.
- Gain the knowledge of DNS & Electronic Mail.

UNIT – I
Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

UNIT-II
Data link layer: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols. Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III
Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV
Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V
Application Layer –Domain Name System, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. PearsonEducation/PHI
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, PearsonEducation
2. "Data and Computer Communications" by William Stallings 9th Edition, Pearson Education2010.
3. "TCP/IP Illustrated" by W. Richard Stevens,Addison-Wesley Professional;2nd edition 2011.

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Open Elective for other Departments
VII Semester syllabus

CS732OE: SOFTWARE ENGINEERING

(Open Elective -II)

(Common to CSB, CSM & CSD)

Course Objectives:

- To understanding of software process models such as waterfall and evolutionary models.
- To understanding of software requirements and SR document.
- To understanding of different software architectural styles.
- To understanding of software testing approaches such as unit testing and integration testing.
- To understanding on quality control and how to ensure good quality software.

Course Outcomes:

- Ability to identify the minimum requirements for the development of application.
- Ability to develop, maintain, efficient, reliable and cost-effective software solutions.
- Ability to write manual test cases.

UNIT- I

Introduction to Software Engineering: The evolving role of software, Changing Natureof Software, Software myths. A Generic view of process: Software engineering- A layered technology, a processframework, The Capability Maturity Model Integration (CMMI).

Process models: The waterfall model, Incremental process models, Evolutionaryprocess models.

UNIT- II

Software Requirements: Functional and non-functional requirements, User requirements,System requirements, the software requirements document.

Requirements engineering process: Feasibility studies, Requirements elicitation andanalysis, Requirements validation.

UNIT- III

Design Engineering: Design process and Design quality, Design concepts, the design model.Creating an architectural design: software architecture, Architectural styles and Architectural Design. Performing User interface design: Golden rules, User interface design steps.

UNIT- IV

Testing Strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of Debugging.

UNIT- V

Quality Management: Software Quality, Formal Technical Reviews, SQA Tasks, Goals, Metrics, Software Reliability.

TEXT BOOKS:

1. Software engineering A practitioner's Approach, Roger S Pressman, sixth editionMcGraw Hill International Edition.
2. Software Engineering, Ian Sommerville, seventh edition, Pearson education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach-James F. Peters, Witold Pedrycz, JohnWiley.
2. Software Engineering principles and practice -Waman S Jawadekar, The Mc Graw-HillCompanies, 2008.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: PearsonEducation.

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Open Electives for other departments
VII Semester Syllabus
CS733OE: JAVA PROGRAMMING
(Open Elective -II)

(Common to CSB, CSM & CSD)

Course Objectives:

- To understand object-oriented programming concepts using Java.
- To implement the concepts of packages and interfaces
- To introduce the concepts of exception handling and multithreading
- To describe various data manipulation operations using collection framework
- To develop Graphical User Interface applications using applets and swing controls

Course Outcomes:

- Able to solve real world problems using OOP techniques.
- Able to implement the concepts of packages and interfaces
- Able to develop multithreaded applications with synchronization
- Able to solve problems using java collection framework
- Able to design GUI based applications

UNIT – I

Object-Oriented Thinking- Introduction to Object-Oriented concepts, Java buzzwords, AnOverview of Java, Data types, Variables and Arrays, operators, expressions, control statements, introducing classes: Class fundamentals, Declaring objects, introducing Methods, Constructors, and this keyword, method overloading, String handling.
Inheritance– Inheritance basics, using super, method overriding, dynamic method dispatch, using abstract class, using final with inheritance and Object class.

UNIT – II

Packages- Defining a Package, CLASSPATH, Access protection, importing packages. Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces, extending interfaces, default interface methods, use static methods in aninterface
Exception handling - Fundamentals of exception handling, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

UNIT – III

Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files,generics.

UNIT – IV

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set. Collection algorithms, Arrays, The Legacy Classes,**More Utility classes**, String Tokenizer,Random, Scanner.

UNIT – V

GUI Programming with Swing – Introduction to AWT, components, containers. UnderstandingLayout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events.**A Simple Swing Application**, Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets, Creating a Swing Applet, Painting in Swing, A Paint example.

Text Books:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education(India) Pvt. Ltd 2014.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd,Pearson Education 2000.

Reference Books:

1. Y. Daniel Liang, Introduction to Java programming, Pearson Education 2013.
2. P. Radha Krishna Object Oriented Programming through Java, University Press 2007.
3. S. Malhotra, S. Chudhary, Programming in Java, 2nd edition, Oxford Univ. Press 2013.

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Open Electives for other departments

VIII Semester Syllabus
CS831OE: Python Programming
(Open Elective -III)

(Common to CSB, CSM & CSD)

Course Objectives

- To learn about Python programming language syntax, semantics, and the runtimeenvironment
- To be familiarized with universal computer programming concepts like data types,containers
- To be familiarized with general computer programming concepts like conditionalexecution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes

- Develop essential programming skills in computer programming concepts like data types,containers.
- Apply the basics of programming in the Python language.
- Solve coding tasks related Exceptions and Functions.
- Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming.
- Solve coding tasks related to GUI Programming.

Unit – I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, andOutput, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.
Repetition Structures: Introduction, while loop, for loop, Input Validation Loops, NestedLoops.

Unit – II

Sequences: Introduction to Sequences: Strings, Lists, and Tuples, Mapping, Set Types and Dictionaries
String: Strings and Operators, Built-in Methods and Special Features of String. Related Modules.
Lists: Operators, Built-in Functions, List Type Built in Methods, Special Features of List,Related Modules
Tuples: Built-in Functions, Tuple Type Built in Methods, Special Features of Tuples, RelatedModules
Mapping and Set Type: Dictionaries, Dictionary Keys, Operators and Built-in Methods. Settype, Operator and Built in Methods. Related Modules.

Unit – III

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions,User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.
Functions: What are Functions, Defining and Creating functions, Function Arguments: Formaland Variable length, Calling functions, Recursive Functions and Variable Scope.
Modules: Modules, Standard Modules, Importing Modules, Namespaces and Packages.

Unit – IV

File Operations: Reading config files in python, Writing log files in python, Understanding readfunctions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modelling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.

Unit – V

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs,Related Modules and Other GUIs.

TEXT BOOKS:

1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage, 2016.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2018.

REFERENCE BOOKS:

1. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press, 2019.
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 2017.
3. Core Python Programming, Wesley J.Chun, Second Edition ,Pearson 2007.

e-Resources:

https://www.tutorialspoint.com/python3/python_tutorial.pdf

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Open Electives for other departments

VIII Semester Syllabus
CS832OE : Internet of Things
(Open Elective -III)

(Common to CSB, CSM & CSD)

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To Introduce Programming Raspberry Pi with Python.
- To introduce the hardware and working principles of various sensors used for IoT

Course Outcomes: On successful completion of the course, the student will:

- Understand the concepts of Internet of Things.
- Design IoT applications in different domain and be able to analyze their performance.
- Able to know the Language features of Python.
- Able to know about working of Raspberry Pi
- Able to know the working of various Sensors.

Unit I:

Introduction to Internet of Things —Introduction, Definition and Characteristics of IoT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical Design of IoT- IoT Functional Blocks, IoT communication models, IoT Communication APIs. IoT Enabling Technologies — Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems.

Unit II:

Domain Specific IoT — Introduction, Home Automation, Smart Cities, Environment- Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle, IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software Defined Networking, Network Function Virtualization

Unit III:

IoT Systems - Logical Design using Python- Introduction, Python Data Types & Data Structures, Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Control Flow- if, for, while, range, break/continue, pass, Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python.

Unit IV:

IoT Physical Devices and Endpoints - What is an IoT Device- Basic building blocks of an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces - serial, SPI, I2C, Programming Raspberry Pi with Python- Controlling LED with Raspberry Pi, interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi.

Unit V:

Buzzer- Function of a Buzzer, Two Kinds of Buzzer, Relays- What is a Relay, Its Working,Relay Uses, Why Relay is used in Motor Control, Relay Module.

Sensors: What is an IoT Sensor, IoT Sensors Types- Pressure Sensors, Light Sensors,Temperature & Humidity Sensors.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti,Universities Press, 2015, ISBN: 9788173719547
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

REFERENCE BOOKS:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,ISBN: 9789350239759.
2. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors) 1stEdition, Kindle Edition by Volker Ziemann.
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk,O'Reilly (SPD), 2016, ISBN 7989352133895.

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Open Electives for other departments

VIII Semester Syllabus

CS833OE : Introduction to Machine Learning

(Open Elective -III)

(Common to CSB, CSM & CSD)

Prerequisites

1. Data Structures
2. Knowledge on statistical methods

Course Objectives:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes:

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias**.**

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back- propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of samplingtheory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, *k*-nearest neighbour algorithm, locally weightedregression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarkson explanation-based learning, explanation-based learning of search control knowledge. **Analytical Learning-2-**Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analyticalapproaches tolearning, using prior knowledge to initialize the hypothesis.

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis