**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY**
AN AUTONOMOUS INSTITUTION
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## COMPUTER SCIENCE AND ENGINEERING

## LIST OF OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS (R22)

1. Object Oriented Programming through Java.
2. Python Programming.
3. R Programming.
4. Database Management Systems.
5. Operating Systems.
6. Computer Networks.
7. Artificial Intelligence.
8. IOT
9. Cyber Security
10. Cloud computing.
11. Fundamentals of Information Technology
12. Computer Architecture

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**COMPUTER SCIENCE AND ENGINEERING**
**OBJECT ORIENTED PROGRAMMING THROUGH JAVA (D5OE01)**

**B.Tech**                                                                                   **L/T/P/C**
                                                                                              **3/0/0/3**

**Course Objective:**
- Understand the features of object oriented paradigm using JAVA programming

**Course Outcomes:**
    After completion of the course the students will be able to,

1. Acquire a comprehensive overview of the Java programming language and Apply key Java buzzwords, inheritance concepts in practical programming situations.  L3
2. Analyze access protection mechanisms within packages to control visibility and encapsulation and develop programs by read from and write to files using Java's I/O capabilities. L4
3. Make use of  try-catch  statements to handle exceptions and thread synchronization mechanisms effectively to write robust and resilient Java programs L3
4. Analyze the  Java Collections Framework for effective data manipulation and utility classes for specific tasks. L4
5. Develop interactive and user friendly graphical applications using MVC architecture. L3

**UNIT – I:**
**Object-Oriented Thinking**
A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions,  Summary of Object-Oriented concepts. History of object-oriented programming, overview of java, Object oriented design, Structure of java program, Java buzzwords, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling.
Inheritance: Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.

**UNIT – II:**
**Packages**
Defining a Package, CLASSPATH, Access protection, importing packages.
Interfaces: Defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.
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, Random access file operations, The Console class, Serialization, Enumerations, auto boxing, generics.

**UNIT – III:**
**Exception Handling**
Fundamentals of exception handling, Exception types, Termination or presumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.
Multithreading , Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, creating multiple threads, synchronizing threads, inter thread communication, dead lock, Suspending, resuming, and stopping threads.

**UNIT IV**
**The Collections Framework (java.util)**
Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List,Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hash table ,Properties, Stack, Vector, More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random,Formatter.

**UNIT V**
**GUI Programming**
Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout 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, Adapter classes, Inner classes, Anonymous Inner classes.

**Text Books:**

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

**Reference Books:**

1. An Introduction to programming and Object Oriented design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, and UniversitiesPress.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ.Press.

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**B.Tech**                                                              **L/T/P/C**
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## PYTHON PROGRAMMING (D5OE02)

**Course Objective:**
- To understand and learn the concepts of basic python programming, as it is a current programming constructs used for real time applications.

**Course Outcomes:**
   After completion of course the student will be able to,

1. Apply different data types for solving problems –L3
2. Construct programs using  operators ,  Expressions,  conditional and control  structures.L3
3. Analyze the scope of variables in functions ,global and local variable usage-L4
4. Implement Packages and create modules by applying the concepts of importing, name spacing .l3
5. Implement OOP principles - classes, methods, inheritance, overriding, and data hiding in Python-L3

## UNIT – I:
### INTRODUCTION
Introduction to Python, History, Need of Python Programming, features Applications, python environment setup, Basic syntax, Variables, Data Types, Keywords, Input-Output, Indentation, script structure, Running Python Scripts.

## UNIT – II:
### OPERATORS
Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations, Conditional statements if, if-else Looping Control Structures for, while Control Statements: Break, Continue, Pass.

## UNIT – III:
### FUNCTIONS
Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.
DATA STRUCTURES
Lists, Tuples, dictionaries, sets, Sequences, Comprehensions.

## UNIT – IV:
FILES
File input/output, Text processing file functions.
MODULES

Creating modules, import statement, from. Name spacing, Packages, using packages, implementing packages: numpy, pandas, Django framework, iterator tools, scipy, matplot lib.

**UNIT – V:**
Object Oriented Programming in Python
Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.  Error and Exception Handling, Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

**Text Books:**

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Wesley J. Chun "Core Python Programming", Second Edition, Prentice Hall.

**Reference Books:**

1. Allen Downey, "Think Python", Second Edition, Green Tea Press.
2. Introduction to Computation & Programming Using Python, Spring 203 Edition, By John V.Guttag.
3. Programming in Python A Complete Introduction to the Python Language (Developer's Library), by Mark Summerfield, 2ndEdition

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**B.Tech**                                                                                              **L/T/P/C**
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### R PROGRAMMING ((D5OE03)

**COURSE OBJECTIVE:**
- Gain knowledge on statistical data manipulation and analysis.

**COURSE OUTCOMES:**

After competition of this course the students will be able to
1. Apply statistical techniques, basic functions and Vectors in R to analyze and interpret data. L3
2. Apply matrix, Lists and Array operations to solve problems and perform data analysis tasks. L3
3. Apply appropriate functions and operations to analyze and summarize data frames, factors, and tables. L3
4. Apply functions to solve specific problems and analyze data using a variety of mathematical and statistical methods-L3
5. Analyze file operations, string manipulation functions and interpret data using graphs and visualizations.L4

**UNIT – I:**
**Introduction to R**
Introduction, Functions, Preview of Some Important R Data Structures, Regression Analysis of Exam Grades, Startup and Shutdown, Getting Help, The help() Function, The example() Function. Vectors Scalars, Vectors, Arrays, and Matrices, Declarations, Common Vector Operations, Using all() and any(),Vectorized Operations, NA and NULL Values, Filtering, Vectorized if-then-else.

**UNIT – II:**
**MATRICES AND ARRAYS**
Creating Matrices, General Matrix Operations, Applying Functions to Matrix Rows and Columns, More on the Vector/Matrix Distinction, Avoiding Unintended Dimension Reduction, Naming Matrix Rows and Columns, Higher-Dimensional Arrays.
LISTS
Creating Lists, General List Operations, Accessing List Components and Values Applying Functions to Lists, Recursive Lists.

**UNIT – III:**
**DATA FRAMES**
Creating Data Frames, Other Matrix-Like Operations, Merging Data Frames, Applying Functions to Data Frames.
FACTORS AND TABLES
Factors and Levels, Common Functions Used with Factors, Working with Tables, Other Factor- and Table-Related Functions.

**UNIT – IV:**
**R PROGRAMMING STRUCTURES**:
Control Statements, Arithmetic and Boolean Operators and Values, Default Values for Arguments, Return values, Functions Are Objects, Environment and Scope Issues, No Pointers in R, Writing Upstairs, Recursion, Replacement Functions, Anonymous Functions.
MATH AND SIMULATIONS IN R: Math Functions, Functions for Statistical, Sorting, Set Operations.

**UNIT – V**
**FILES:**
Accessing the Keyboard and Monitor, Reading and Writing Files, Accessing the Internet.
STRING MANIPULATION: String-Manipulation Functions.
GRAPHICS: Creating Graphs, Customizing Graphs

**TEXT BOOK:**

1. The Art of R Programming by Norman Matloff-No Starch Press.

**REFERENCE BOOKS:**

1. R Programming for Bioinformatics by Robert Gentleman—CRC Press.
2. Data Analytics using R by Seema Acharya-TMH.
3. Hands-On Programming with R by Grrett Grolemund-OREILLY.
4. Beginners guide for Data Analytics using R by Jeeva Jose-Khanna Publications.
5. R for Beginners by Sandip Bakshit-TMH.

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**B.Tech**                                                                                              **L/T/P/C**
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## DATABASE MANAGEMENT SYSTEMS (D5OE04)

### Course Objective:
- Understand the fundamentals of relational systems including data models, databases.


### Course Outcomes:
Upon completion of course the student will able to

1. Apply database management principles in designing relational databases.L3
2. Construct ER diagram to design databases to perform operations using Relational Algebra & calculus.L3
3. Apply normalization techniques on a database constructed by using SQL . L3
4. Implement transaction processing and concurrency control techniques for a given database. L3
5. Apply indexing techniques to perform data manipulation tasks for a given database.L3

### UNIT I
**Introduction and Basic Concepts**
File organization for conventional data management system, Higher-level file organization for DBMS, Database System Applications, Purpose of Database Systems, View of Data, Database Languages DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators.
Introduction to Database 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, Conceptual Design for Large enterprises.

### UNIT II
**Relational Model**
Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity, constraints, Querying relational data, Logical database Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.
Relational Algebra and Calculus Preliminaries, Relational Algebra, Relational calculus Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

### UNIT III
**SQL**
SQL data definition and Data types, Schema and catalog concepts in SQL, Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values, Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases, No SQL database (MongoDB introduction).
Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional

Dependencies -Reasoning about FDs, Normal Forms - 1NF, 2NF, 3NF, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

## UNIT IV
### Transaction Management
Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, serializability and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels. Concurrency Control, Lock–Based Protocols, Multiple Granularity, Time stamp-Based Protocols, Validation-Based Protocols, Multi-version Schemes. Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of non-volatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

## UNIT V
### Indexing
Index Data Structures, and Comparison with File Organizations. Tree-Structured Indexing, Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete, Hash- Based Indexing, Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

### Text Books:

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

### Reference Books:

1. Database Systems, 6th edition, RElmasri, Shamkant B.Navathe, Pearson Education.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning.
3. Introduction to Database Management, M.L.Gillenson and others, Wiley, Student Edition.
4. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
5. Introduction to Database Systems, C.J. Date, Pearson Education.

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**B.Tech**                                                                                 **L/T/P/C**
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### Operating Systems (D5OE05)

**Course Objective:**
- To understand the basic components of a computer operating system, scheduling polices, process synchronization, deadlocks, memory management strategies and file system implementation.

**Course Outcomes:**
   Upon completion of course the student will able to,
1. Identify the components, structure, OS services and analyze the role of an Operating System in developing software applications. L3
2. Make use of the concepts of CPU scheduling, including scheduling criteria and inter process communication, and apply them to solve scheduling problems. L3
3. Apply synchronization techniques to coordinate access to shared resources among concurrent processes and various mechanisms to detect and recovery the    deadlocks.L3
4. Analyze memory management and virtual memory management strategies and their significance in modern computing environments. L4
5. Make use of the structure of file system and principles of protection to develop secure, efficient and reliable computing environments. L3.

**UNIT – I:**
**Overview Introduction**-Operating system objectives, User view, System view, Operating system definition, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments. Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

**UNIT – II:**
CPU Scheduling Process concepts-The Process, Process State, Process Control Block, Threads, Process Scheduling, Scheduling Queues, Schedulers, Context Switch, Operations on Processes, System calls fork(),exec(),wait(),exit(), Inter-process communication-ordinary pipes and named pipes, message queues, shared memory in Unix.
Process Scheduling-Basic concepts, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real Time Scheduling, Thread scheduling, Linux scheduling and Windows scheduling.

**UNIT – III:**
Process Synchronization, Background, The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization in Linux and Windows. Deadlocks-System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

**UNIT – IV:**
Memory Management: 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, Allocation of Frames, Thrashing, Virtual memory in Windows.

**UNIT – V:**
Storage Management: File System- Concept of a File, System calls for file operations –open (), read (), write (), close (), seek (), unlink (), Access methods, Directory and Disk Structure, File System Mounting, File Sharing.
File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation methods, Free-space Management, Efficiency, and Performance, Overview of Mass Storage Structure.  Protection System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

**Text Books:**

1. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne,
8 th Edition, Wiley, 2016 India Edition.
2. Operating Systems – Internals and Design Principles, W. Stallings, 7th Edition,
Pearson.

**Reference Books:**

1. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, PHI
2. Operating Systems: A concept-based Approach, 2nd Edition, D.M. Dhamdhere,
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition,
TMH.
4. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
5. Principles of Operating systems, Naresh Chauhan, Oxford University Press.

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**B.Tech**                                                                          **L/T/P/C**
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## COMPUTER NETWORKS (D5OE06)

### Course Objective:

• Identify the components required to build different types of networks and choose the required functionality at each layer for a given application

### Course Outcomes:
Upon completion of the course the student will be able to,

1. Compare and contrast different network models and their significance in networking architecture. L4
2. Apply and analyze the principles of framing , error control and implement elementary protocols to design robust and reliable data link layer protocols. L4
3. Analyze and apply various routing algorithms to design efficient and scalable network architectures. L4
4. Analyze and compare the Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) in terms of their features and Evaluate congestion control algorithms L4
5. Develop the ability to troubleshoot and resolve issues related to application layer protocols, ensuring seamless interaction and data exchange in the online environment. L3

### UNIT – I:
Introduction: OSI, TCP/IP, and other network models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.
Physical Layer: Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications; Narrowband, broadband ISDN and ATM.

### UNIT – II:
Data link layer: Design issues, framing, error detection and correction, CRC, Elementary Protocol- stop and wait, Sliding Window, Slip, Data link layer in HDLC, Internet, ATM.
Medium Access sub layer: ALOHA, MAC addresses, Carrier sense multiple access. IEEE 80.X Standard Ethernet, wireless LANs, Bridges.

### UNIT – III:
Network Layer: Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing. Dynamic routing – Broadcast routing. Rotary for mobility, The Network layer on the internet and in the ATM Networks.

### UNIT – IV:
Transport Layer: Transport Services, Connection management, TCP and UDP protocols;
Congestion Control Algorithms – General Principles – of Congestion prevention policies ATM AAL Layer Protocol.

**UNIT – V:**
Application Layer – Domain name system, SNMP, Electronic Mail (SMTP, POP3, IMAP,MIME) the World WEB, HTTP.

**TEXT BOOKS:**

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.

**REFERENCE BOOKS:**

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.
3. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH

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## ARTIFICIAL INTELLIGENCE (D5OE07)

**Course Objective:**

- Understand state space representation, search algorithms, knowledge representation techniques and applications of artificial intelligence in different domains.

**Course Outcomes:**
    After completion of the course the student will be able to,

1. Apply theoretical knowledge to practical problem-solving scenarios across various domains, fostering critical thinking and problem-solving skills. L3
2. Utilize propositional theorem proving techniques such as resolution, horn clauses, and definite clauses to derive logical conclusions and make inferences. L3
3. Apply the principles of logic and knowledge representation using First-Order Logic to model and solve problems in various domains. L3
4. Analyze the strengths and limitations of different planning approaches using the factors: problem complexity, resource constraints, and domain dynamics. L4
5. Utilize inference techniques using full joint distributions, independence, and Bayes rule to perform probabilistic reasoning and make probabilistic predictions. L3

**UNIT – I:**
Introduction to AI, Intelligent Agents, problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first, search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

**UNIT – II:**
Problem Solving by Search-II and Propositional Logic
Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.
Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

**UNIT – III:**
Logic and Knowledge Representation
First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**UNIT – IV:**
Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.
Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**UNIT – V:**
Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

**TEXT BOOK:**

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

**REFERENCE BOOKS:**

1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

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## COMPUTER SCIENCE AND ENGINEERING

**B.Tech**                                                                                    **L/T/P/C**
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### INTERNET OF THINGS (D5OE08)

**Course Objectives:**

- Understand IoT Terminology, Technologies, Python scripting, Raspberry Pi, IoT devices, application framework and integrated IoT solutions.

**Course Outcomes:**
    After completion of the course the student will be able to,

1. Utilize the physical design aspects, logical design principles of IoT systems in real time applications..L3
2. Utilize the protocols SDN,NFV,NETCONF-YANG and SNMP in deploying and managing IoT systems. L3
3. Apply Python programming concepts to build IoT applications.L3.
4. Identify physical devices, endpoints, servers, and cloud offerings to engineer resilient IoT solutions. L3
5. Apply IoT technologies in home automation, environmental monitoring, agriculture and healthcare applications.L3

**UNIT – I:**
Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of
IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates
Domain Specific IoTs – Home automation, Environment, Agriculture, Health and Lifestyle

**UNIT – II:**
IoT and M2M – M2M, Difference between IoT and M2M, SDN and NFV for IoT, IoT System
Management with NETCOZF, YANG- Need for IoT system Management, Simple Network
management protocol, Network operator requirements, NETCONF, YANG, IoT Systems
Management with NETCONF-YANG

**UNIT – III:**
IoT Systems – Logical design using Python-Introduction to Python – Python Data types Data
structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations,
Classes, Exception, Python packages of Interest for IoT

**UNIT - IV**
IoT Physical Devices and Endpoints - Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi
Interfaces,  Programming Raspberry PI with Python, Other IoT devices.
IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and
communication APIs, WAMP-AutoBahn for IoT, Xively Cloud for IoT, Python web application
framework –Django, Designing a RESTful web API

**UNIT – V:**
Case studies- Home Automation, Environment-weather monitoring-weather reporting- air pollution monitoring, Agriculture.

**TEXT BOOK:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.

**REFERENCE BOOK:**

1. Getting Started with Raspberry Pi, Matt Richardson &amp; Shawn Wallace, O&#39;Reilly (SPD), 2014, ISBN: 9789350239759.

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## COMPUTER SCIENCE AND ENGINEERING

**B.Tech**                                                                            **L/T/P/C**
                                                                                      **3/0/0/3**
### CYBER SECURITY (D5OE09)

**Course objective:**
- Understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks

**Course Outcomes:**
        After completion of the course the student will be able to,

1. Identify the phenomenon of cybercrime based on classification in line to Indian Regulations and the essence to eradicate cyber offenses and criminal plans. L3
2. Identify the challenges posed by mobile and wireless devices in terms of attacks and policies  framed for handling mobile and wireless devices. L3
3. Apply the knowledge in implying the legal perspectives with respect to the phenomenon of cyber-crimes and cyber security acts. L3
4. Identify  the tools and methods used for committing cyber crimes L3
5. Identify the organizational implications caused in view of cybercrimes and understands    the causes of cyber terrorism like, psychology, Mind-set and skill of Hackers, role of    social political, ethical, and intellectual property in the cyberspace. L3

**UNIT – I:**
Introduction to Cybercrime Introduction, Cybercrime and Information Security, Cybercriminals, Classification of Cybercrimes, The legal Perspectives, An Indian Perspective, Cybercrime and the Indian ITA
2000, Global Perspective on Cybercrimes, Cybercrime Era. Cyber offenses: Criminal Plans Introduction, Criminal Plans the Attacks, Social Engineering, Cyber stalking, Cyber café and Cybercrimes, Botnets, Attack Vector, Cloud Computing,

**UNIT – II:**
Cyber Crime: Mobile and Wireless Devices Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices,
Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations,  rganizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT – III:**
Tools and Methods Used in Cyber Crime Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Network

**UNIT – IV:**
Cyber Crimes and Cyber Security: The Legal Perspectives Introduction, Cybercrime and the Legal Landscape around the World, Need of Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime andPunishment, Cyber law, Technology and Students Indian Scenario

**UNIT – V:**
Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR Issues, Web Threats for Organizations, Security and Privacy Implications from Cloud Computing, Social Media Marketing, Social Computing and the Associated Challenges for Organizations, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling, Cybercrime and Cyber Terrorism: Social, Political, Ethical and Psychological Dimensions Intellectual Property in the Cyberspace, The ethical dimensions of the cybercrimes, The Psychology, Mindset and Skills of Hackers and Other Cybercriminals, Sociology of Cybercriminals, Information Warfare

**Text Books:**

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

**Reference Books:**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.
3. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

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**B.Tech.**                                                                          **L/T/P/C**
                                                                                     **3/0/0/3**
### CLOUD COMPUTING (D5OE10)

**Course Objective:**
• Understand the knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing the state-of-the-art in Cloud Computing fundamental issues, technologies, applications.

**Course Outcomes:**
        After completion of the course the student will be able to,

1. **Analyze** Challenges and Risks in cloud computing- **L4**
2. Identify the importance of integration as a service and the phenomenon of enterprise cloud computing paradigm.-**L3**
3. Make **use** of infrastructure as a service(IAAS) ,Platform and software as a service–**L3**
4. Compare &contrast to manage, monitor, and apply a cloud, using governance.-L4
5. Develop different cloud services-L3

**UNIT – I:**
Introduction to Cloud Computing: Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks Migrating into a Cloud: Introduction, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud

**UNIT – II:**
Enriching the 'Integration as a Service' Paradigm for the Cloud Era: The Onset of Knowledge Era, The Evolution of SaaS, The Challenges of SaaS Paradigm, Approaching the SaaS Integration Enigma, New Integration Scenarios, The Integration Methodologies, SaaS Integration Products and Platforms, SaaS Integration Services, Businesses-to-Business Integration (B2Bi) Services, A Framework of Sensor—Cloud Integration, SaaS Integration Appliances The Enterprise Cloud Computing Paradigm: Issues for Enterprise Applications on the Cloud, Transition Challenges, Enterprise Cloud Technology and Market Evolution, Business Drivers Toward a Marketplace for Enterprise Cloud Computing, TheCloud SupplyChain

**UNIT – III:**
Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS):
Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing .Aneka, Comet Cloud, T-Sytems', Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

**UNIT – IV:**
Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

**UNIT – V:**
Governance and Case Studies: Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

**Text Books:**

1. Cloud Computing:Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, W iley, 2011.

**Reference Books:**
1. A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, 2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
3. Cloud Computing: Implementation, Management and Security, JohnW. Rittinghouse, James F.Ransome, CRC Press, rp2012.
4. C lo ud A pp lication A rc hitectures: Bu ilding A pp lication s an dInfrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly,SPD, rp2011
6. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, JackJ.Dongarra, Elsevier, 2012

**COMPUTER SCIENCE AND ENGINEERING**

**B.Tech**                                                                                      **L/T/P/C**
                                                                                                      **3/0/0/3**

### FUNDAMENTAL OF INFORMATION TECHNOLOGY (D5OE11)

**Course Objective:**
- Understand the basic fundamentals of computers, computer organization, Operating system, Programming concepts, software engineering , Database management system  and object oriented conepts.

**Course Outcomes:**
    After learning the contents of this course, the student will be able to,

1.Identify the components of a computer and system software required to develop software. L3
2.Analyze Operating System functionalities and develop simple programs using C.  L4
3.Analyze various software development methodologies and list the elements of UI Design. L4.
4.Apply normalization techniques and  SQL commands in designing database. L3
5.Apply object oriented concepts in developing software projects using Rational Rose .L3

**UNIT - I:**
**Fundamentals of Computers:** Introduction, Architecture, organization of a small computer, center Processing Unit, Execution cycle, Instruction categories, measures of CPU performance, Memory, Input/output devices, BUS-addressing modes. **System Software:** Assemblers, Loaders and linkers, compilers and interpreters.

**UNIT - II:**
**Operating System:** introduction, memory management schemes, Process management, scheduling, threads. **Programming Fundamentals:** Problem solving with algorithms, Programming styles, coding Standards and Best practices, Introduction to C Programming, Testing and Debugging. Code reviews.

**UNIT - III:**
**System Development Methodologies:** Software development Models. **User Interface Design:** introduction, the process, Elements of UI design & reports.

**UNIT - IV:**
**RDBMS:** Introduction, Data processing, the database technology, Data models **ER Modeling:** Concept, Notations, Extended ER features, Logical database design **Normalization:** Functional Dependency, Normal Forms. **SQL:** DDL statements, DML statements, DCL statements, writing Simple queries. **SQL tuning techniques:** Embedded SQL, OLTP.

**UNIT - V:**

**Object oriented concepts:** Object oriented programming, relationship, Inheritance, Abstract classes, polymorphism, UML Diagrams, Object Oriented Design Methodology.
**Rational Rose Tool:** Application of OOC using Rational Rose Tool.

**TEXT BOOKS:**

1. Andrew S. Tanenbaum, Structured Computer Organization,PHI,3rd ed.,1991
2. Siberschatz and Galvin, Operating System Concepts, 4th ed., Addision-Wesley,1995
3. Dromey R.G., How to solve it by Computers PHI,1994
4. Kernighan, Ritchie, ANSI C language PHI,1992
5. Wilbert o.Galitz essential Guide to user interface design john,wiley,1997
6. Alex Berson, Client server Architecture, McGrew Hill International,1994
7.  Roger Pressman,Software Engineering-A Practitioners approach, McGraw Hill 5thed., 2001
8. Alfred V Aho,E Hoproft, Jeffrey D Ullman, Design and Analysis of
    computer algorithms, Addison Wesley publishing Co..;1998
9. Henny F korth , Abraham Silbefrschatz, Database System concept, 2nd . McGraw-
    Hill international editions,1991
10. Elmasri and Navathe, Fundamentals of Database systems, 4th edition, admison
    Wesely, Person Eductaion

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                                                                                                        **3/0/0/3**

**COMPUTER ARCHITECTURE (D5OE12)**

**Course Objective:**
- Understand the detailed computer architecture and organization, hardware operation of digital computer.

**Course Outcomes:**
   After learning the contents of this course, the student will be able to,

1. Make use of the principles of computer organization of a computer. L3
2. Create designs for both hardwired and micro-programmed control units, showcasing proficiency in the architectural aspects of 8086. L3
3. Evaluate computer arithmetic operations and develop fundamental Assembly Language Programs for the 8086 processor. L4
4. Assess I/O data transfer modes and memory hierarchy in detail. L4
5. Analyze how the principles and mechanisms of concurrent processing are useful for processing computer systems. L4

**UNIT – I:**
**Digital Computers**
Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture .Basic Computer Organization and Design Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.

**UNIT – II:**
**Central Processing Unit**
Processor Organization, Register Organization, Instruction cycle, hardwired control unit, Micro program control unit. The 8086 Processor Architecture, Register organization, Physical memory organization, General Bus Operation, I/O Addressing Capability, Special Processor Activities, Minimum and Maximum mode system and timings.

**UNIT – III:**
**Computer Arithmetic**
Introduction, The arithmetic logic unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating - point Arithmetic operations. Data Transfer and Manipulation

**UNIT – IV:**
**Input-Output Organization**
Peripheral Devices, Input Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input–Output Processor (IOP), Intel 8089 IOP. Memory Organization Memory Hierarchy, Auxiliary memory, Associate Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

**UNIT – V:**
**Pipeline and Vector Processing**
Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, CISC, RISC versus CISC, Vector Processing, Array Processors.
Multi Processors: Characteristics of Multi processors, Inter connection Structures, Inter processor arbitration, Inter processor communication, and synchronization.

**TEXT BOOKS**:

1. Computer System Architecture, M.Moris Mano, Third Edition, Pearson.
2. Advanced Micro processors and Peripherals, KM Bhurchandi, A.K Ray, 3rdedition, McGraw Hill India Education Private Ltd.

**REFERENCE BOOKS:**

1. Microprocessors and Interfacing, DV Hall, SSSP Rao, 3rdedition, McGraw Hill India Education Private Ltd.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.
3. Computer Organization and Architecture, William Stallings, 9th Edition, Pearson.
4. David A. Patterson, John L. Hennessy: Computer Organization and Design–The Hardware /Software Interface ARM Edition,4th Edition