



TKR COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

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Computer Science & Engineering Open Electives R20

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



COMPUTER SCIENCE & ENGINEERING

B.Tech

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OBJECT ORIENTED PROGRAMMING THROUGH JAVA (C5OE01)

Course Objective:

To provide students with a comprehensive understanding of the features of object oriented paradigm using JAVA programming

Course Outcomes:

Upon completion of the course the student will be able to:

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| 1. Apply concepts of inheritance, polymorphism, and class hierarchies in Java, and analyze the structure and features of Java programs, including data types, variables, control statements, and methods. | L3 |
| 2. Classify and differentiate between stream-based I/O mechanisms, and analyze various I/O operations including file handling, serialization, and advanced features like Enumerations auto-boxing, and generics. | L4 |
| 3. Analyze different exception types and handling mechanisms and evaluate Java thread Model features including thread creation, synchronization, and inter-thread communication. | L4 |
| 4. Classify and differentiate between various collection interfaces and classes, and apply Collection Algorithms and utility classes for effective data management. | L4 |
| 5. Apply the Model-View-Controller (MVC) architecture, and implement various layout managers, Event handling mechanisms, including event sources, listeners, and adapter classes in Java. | 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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PYTHON PROGRAMMING (C5OE02)

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:

Upon completion of Course the students will be able to:

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| 1. Apply different data types for solving problems. | L3 |
| 2. Apply operators & develop Expressions & analyze the control flow structures. | L4 |
| 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, matplotlib 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 3: A Complete Introduction to the Python Language (Developer's Library), by Mark Summerfield, 2ndEdition.



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R PROGRAMMING (C5OE03)

Course Objectives:

To equip students with the skills to use R programming for comprehensive data analysis and interpretation.

Course Outcomes:

Upon completion of the course 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: Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

UNIT II

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

UNIT III

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, DATA FRAMES, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations.

UNIT IV

FACTORS AND TABLES, Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Subtable, R16 B.TECH IT Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

UNIT V

OBJECT-ORIENTED PROGRAMMING: S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

Text Books:

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Prashanth singh, Vivek Mourya, Cengage Learning India.



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DATABASE MANAGEMENT SYSTEMS (C5OE04)

Course Objective:

To provide students an in depth understanding of the fundamentals of relational systems including data models, databases.

Course Outcomes:

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

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| 1. Develop a foundational understanding of database management systems (DBMS), their evolution, importance, and the fundamental concepts that govern their design and operation. | L3 |
| 2. Compare and examine the expressive power, capabilities, advantages, and limitations Of relational algebra and calculus in querying relational databases. | L4 |
| 3. Develop expertise in formulating complex SQL queries, constraints, conditions, and expressions to retrieve, manipulate, and manage data based on specific criteria, requirements, and business rules. | L3 |
| 4. Develop a foundational understanding of transactions, their definition, properties, and significance in Ensuring data consistency, integrity, and reliability in database systems. | L3 |
| 5. Compare and contrast index data structures with traditional file organizations. | L4 |

UNIT I

Introduction

Introduction and basic concepts, File organization for conventional data management system, Higher-level file organization for DBMSs, 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.

Relational Model

Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT II

Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus. 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, Conceptual Design for Large enterprises.

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.

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, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels. Concurrency Control Lock-Based Protocols, Multiple Granularity, Timestamp-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. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition.
2. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education (India) Private Limited l, 6th edition.

Reference Books:

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



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OPERATING SYSTEMS (C5OE05)

Course Objective:

To provide students an in depth understanding of basic components of a computer operating system, scheduling policies, deadlocks, memory management, synchronization, system calls and file systems.

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

1. Identify the components and structure of Operating System and the services provided by an Operating System and Analyze the role of Operating System to develop software applications. L4
2. Identify and solve issues related to the critical section problem by using the knowledge of process Scheduling and implement the existing algorithms to evaluate the performance. L3
3. Analyze the process scheduling to handle and prevent deadlocks, compare and contrast memory Management strategies for efficient utilization of memory. L4
4. Analyze the performance of demand paging and page replacement algorithms, and implementation of System calls for a given file system. L4
5. Analyze the role of mass storage in supporting file systems and protection mechanisms in preventing unauthorized access. L4

UNIT I

Operating System - Introduction, Structures - Simple Batch, Multi programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

UNIT II

Process and CPU Scheduling - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Inter process Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, wait pid, exec.

UNIT III

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

Text Books:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

Reference Books:

1. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI.
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education.
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.



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COMPUTER NETWORKS (C5OE06)

Course Objective:

To provide students an in depth understanding of the components required to build different types of networks and choose therequired functionality at each layer for a given application

Course Outcomes:

Upon completion of the course the student will be able to:

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| 1. Compare and contrast different network models and their significance in networking architecture. | L4 |
| 2. Develop elementary protocols by applying the knowledge of principles of framing and error control to Design robust and reliable data link layer protocols. | L3 |
| 3. Make use of various routing algorithms and analyze them 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. Utilize the knowledge on how to address and resolve issues related to application layer protocols, Ensuring seamless interaction and data exchange in 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 (C5OE07)

Course Objectives:

To provide students an in depth understanding of different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge- based systems and to apply knowledge representation, reasoning.

Course Outcomes:

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

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| 1. Gain Knowledge on AI Phenomenon, and make use of state space representations, apply heuristic techniques to solve problems. | L3 |
| 2. Apply knowledge representation issues to build Predicate logic and Knowledge rules. | L3 |
| 3. Utilize the effectiveness of statistical reasoning methods, including Bayesian networks and fuzzy logic In specific contexts. | L3 |
| 4. Compare and contrast different slot-and-filler structures for representing Knowledge. | L4 |
| 5. Implement hierarchical planning techniques to model and solve multi-level planning scenarios. | L4 |

UNIT I

What is Artificial Intelligence?

The AI Problems, The Underlying Assumption, What is an AI Technique?

Problems, Problem Spaces. and Search

Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs, Additional problems

Heuristic Search Techniques

Generate-and-Ted, Hill Climbing, Rest-first Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis

UNIT II

Knowledge Representation Issues:

Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, The Frame Problem

Using Predicate Logic

Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction

Representing Knowledge Using Rules

Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge IP.

UNIT III**Symbolic Reasoning Under Uncertainty:**

Introduction to Non monotonic Reasoning, Logics for Non monotonic Reasoning, Implementation Issues, Augmenting a Problem-solver, Implementation: Depth-first Search, Implementation: Breadth-first Search

Statistical Reasoning

Probability and Bayesian Theorem, Certainty Factors and Rule-based Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic

UNIT IV

Weak Slot-and-Filler Structures: Semantic Nets, Frames

Strong Slot-and-Filler Structures: Conceptual Dependency, Scripts, CYC 216

UNIT V**Game Playing**

The Minimax Search Procedure, Adding Alpha-beta Cutoffs, Additional Refinements, Iterative Deepening, References on Specific Games

Planning:

An Example Domain: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques

Text Book:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, ThirdEdition, 2009.

Reference Books:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice Hall, 2010.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed.,2009.



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INTERNET OF THINGS (C5OE08)

Course Objective:

To provide students to design and develop comprehensive IoT solutions by understanding and applying IoT concepts, communication models, enabling technologies, networking protocols, hardware platforms such as Arduino and Raspberry Pi, and cloud-based IoT platforms.

Course Outcomes:

Upon completion of this course students will be able to:

1. Apply foundational concepts of the Internet of Things (IoT), including its physical and logical design, communication models, enabling technologies, and deployment templates, to implement basic IoT solutions and applications. L3
2. Apply knowledge of IoT and M2M communication, SDN, NFV, and NETCONF-YANG to manage And differentiate between IoT and M2M systems effectively. L3
3. Apply various IoT networking concepts and connectivity technologies, including IEEE 802.15.4, ZigBee, 6LoWPAN, and others, to implement effective IoT networks and wireless sensor networks (WSNs). L3
4. Analyze the features and components of Arduino and Raspberry Pi, evaluate their Programming Environments and architectures, and design effective IoT solutions based on these platforms. L4
5. Analyze and build IoT solutions using various cloud platforms and storage models, including WAMP-AutoBahn, Xively, and Amazon Web Services, to meet specific project requirements. L4

UNIT I

Introduction to Internet of Things:

Introduction, physical design of IoT, logical design of IoT-functional blocks, communicational models, communication APIs, IoT enabling technologies, IOT levels & deployment templates, Characteristics of IoT, Applications of IoT, IoT Enablers and Connectivity Layers, Baseline Technologies,, Sensors, Actuators, IoT Components and Implementation, Challenges of IoT.

UNIT II

IoT AND M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Origin of SDN, SDN Architecture, Rule Replacement, IoT System Management with NETCONF-YANG: Need for IOT systems management, simple network management protocol, network operator requirements, NETCONF, YANG, IoT system management with NETCONF-YANG,

UNIT III

IoT networking: Connectivity Terminologies, Gateway Prefix Allotment, Impact of Mobility on Addressing, Multihoming,, Deviations from regular Web, IoT Identification and Data Protocols.

Connectivity technologies: IEEE 80.15.4, ZigBee, 6LoWPAN, RFID, HART and Wireless HART, NFC, Bluetooth, Z-Wave, ISA 10.11A

Wireless Sensor networks: Components of a Sensor Node, Modes of Detection, Challenges in WSN, Sensor Web.

UNIT IV

ARDUINO: Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Function Libraries, Random Numbers, Interrupts.

RASPBERRY: Introduction, Architecture, PIN Configuration.

UNIT V**IoT Platforms Design Methodology**

IoT Physical Servers & Cloud Offerings: Cloud Storage Models & Communication APIs,, WAMP-Auto Bahn for IoT, Xively Cloud for IoT, Amazon Web Services for IoT.

Text Books:

1. Internet of Things by Arshadeep Bagha, Madisetty Vijay, University Press
2. Internet of Things by Jiva jose, Khanna Book Publishing Co. (P) Ltd.

Reference Books:

1. Getting Started with Raspberry Pi, 2nd Edition, Matt Richardson and Shawn Wallance, SPD.
2. Internet of Things Principles and Paradigms, Rajkumar Buyya and Amir Vahid Dastjerdi, ELSEVIER.



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CYBER SECURITY (C5OE09)

Course Objective:

To provide students with a comprehensive understanding of cyber-attacks, types of cybercrimes, cyber laws and also how to protect themselves and ultimately the entire Internet community from such attacks.

Course Outcomes:

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

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| 1. Analyze the phenomenon of cybercrime based on classification in line to Indian regulations. Learn 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. Analyze the tools and methods used for committing cybercrimes. | L4 |
| 4. Identify the legal perspectives with respect to the phenomenon of cyber-crimes and cyber security acts. | L3 |
| 5. Identify the organizational implications caused in view of cybercrimes and understand 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 cafe 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, Organizational 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, Keyloggers 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 and Punishment, 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.



TKR COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

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COMPUTER SCIENCE & ENGINEERING

B.Tech

L/T/P C
3/0/0 3

CLOUD COMPUTING (C5OE10)

Course Objective:

To provide students an in depth understanding of 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:

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

- | | |
|---|----|
| 1. Analyze Challenges and Risks in cloud computing while migrating the applications into the cloud. | L4 |
| 2. Apply the principles of Integration as a Service (IaaS) to address the challenges of SaaS paradigms and Identify business drivers for enterprise cloud adoption, including the cloud supply chain. | L3 |
| 3. Make use of infrastructure as a service (IAAS), Platform and software as a service. | L3 |
| 4. Apply architectural principles to design and manage federated cloud computing environments, including SLA management and performance prediction for HPC on clouds. | L3 |
| 5. Identify the strategies for organizational readiness and change management in the cloud era, addressing data security, legal issues, and achieving production readiness for cloud services through practical case studies. | 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, The Cloud Supply Chain

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, Wiley, 2011.

Reference Books:

1. A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata Mc Graw 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 loud Application Architectures: Building Application s and Infrastructure 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.



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COMPUTER SCIENCE & ENGINEERING

B.Tech

L/T/P C

3/0/0 3

FUNDAMENTALS OF INFORMATION TECHNOLOGY (C5OE11)

Course Objective:

To provide students an introduction to skills relating to IT basics, computer applications, programming, interactive media, Internet basics.

Course Outcomes:

After completion of this course, student will be able to:

- | | |
|--|----|
| 1. Identify the basic concepts and terminology of information technology. | L3 |
| 2. Classify and differentiate various I/O devices , their types and functionalities, and analyze their Applications in practical computing scenarios. | L4 |
| 3. Classify and compare system software, programming languages, and application software, and analyze Their advantages, disadvantages, and applications in real-world scenarios. | L4 |
| 4. Compare and contrast different processing techniques and operating systems, and analyze the roles of Assemblers, compilers, and interpreters in software development. | L4 |
| 5. Classify and organize different methods of data storage and file organization, and analyze and perform Computer arithmetic operations including conversions between various number systems. | L4 |

UNIT I

Introduction to Computers:

Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer.

Basic Computer Organization:

Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.

UNIT II

Storage Fundamentals:

Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives.

UNIT III**Software:**

Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w.

Operating System:

Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.

UNIT IV**Data Communication:**

Communication Process, Data Transmission speed, Communication Types (modes), Data Transmission Medias, Modem and its working, characteristics, Types of Networks, LAN Topologies, Computer Protocols, Concepts relating to networking.

UNIT V**Business Data Processing:**

Introduction, data storage hierarchy, Method of organizing data, File Types, File Organization, File Utilities.

Computer Arithmetic:

Binary, Binary Arithmetic, Number System: Positional & Non Positional, Binary, Octal, Decimal, Hexadecimal, Converting from one number system to another, converting from one number system to another, Converting from one number system to another.

TEXT BOOK:

1. Computer Fundamentals by P.K.Sinha.



COMPUTER SCIENCE & ENGINEERING

B.Tech

**L/T/P C
3/0/0 3**

COMPUTER ARCHITECTURE (C5OE12)

Course Objective:

The Computer Architecture course aims to describe a broad range of architectural designs and to contrast them, highlighting the design decisions

Course Outcomes:

At the end of this course, students will be able to:

- | | |
|---|----|
| 1. Analyze CISC and RISC architectures, data types, arithmetic operations, and CPU control unit Operations and explain the hardware implementation of CPUs, system buses, and multi-bus organizations through microprogramming. | L4 |
| 2. Classify and differentiate various types of system memory, cache memory, and virtual memory, and analyze the implementation and management of memory, including the roles of magnetic hard disks and optical disks. | L4 |
| 3. Analyze I/O accessing methods, the roles and functions of DMA, interrupts, and bus architectures. | L4 |
| 4. Develop efficient programs in assembly language of the 8086 family of microprocessors. | L3 |
| 5. Analyze instruction-level pipelining (ILP), compiler techniques, data hazards, and dynamic scheduling, and evaluate branch costs, branch prediction methods, and their influence on the instruction set. | L4 |

UNIT I

Introduction to computer organization

Architecture and function of general computer system, CISC Vs RISC, Data types, Integer Arithmetic - Multiplication, Division, Fixed and Floating point representation and arithmetic, Control unit operation, Hardware implementation of CPU with Micro instruction, microprogramming, System buses, Multi-bus organization.

UNIT II

Memory organization

System memory, Cache memory - types and organization, Virtual memory and its implementation, Memory management unit, Magnetic Hard disks, Optical Disks.

UNIT III**Input – output Organization**

Accessing I/O devices, Direct Memory Access and DMA controller, Interrupts and Interrupt Controllers, Arbitration, Multilevel Bus Architecture, Interface circuits - Parallel and serial port. Features of PCI and PCI Express bus.

UNIT IV**16 and 32 microprocessors**

80x86 Architecture, IA – 32 and IA – 64, Programming model, Concurrent operation of EU and BIU, Real mode addressing, Segmentation, Addressing modes of 80x86, Instruction set of 80x86, I/O addressing in 80x86

UNIT V**Pipelining**

Introduction to pipelining, Instruction level pipelining (ILP), compiler techniques for ILP, Data hazards, Dynamic scheduling, Dependability, Branch cost, Branch Prediction, Influence on instruction set.

Text Books:

1. V. Carl, G. Zvonko and S. G. Zaky, “Computer organization”, McGraw Hill, 1978.
2. B. Brey and C. R. Sarma, “The Intel microprocessors”, Pearson Education, 2000.
3. J. L. Hennessy and D. A. Patterson, “Computer Architecture A Quantitative Approach”, Morgan Kauffman, 2011.

Reference Books:

1. W. Stallings, “Computer organization”, PHI, 1987.
2. P. Barry and P. Crowley, “Modern Embedded Computing”, Morgan Kaufmann, 2012.
3. N. Mathivanan, “Microprocessors, PC Hardware and Interfacing”, Prentice Hall, 2004.
4. Y. C. Lieu and G. A. Gibson, “Microcomputer Systems: The 8086/8088 Family”, Prentice Hall India, 1986.
5. J. Uffenbeck, “The 8086/8088 Design, Programming, Interfacing”, Prentice Hall, 1987.
6. B. Govindarajalu, “IBM PC and Clones”, Tata McGraw Hill, 1991.
7. P. Able, “8086 Assembly Language Programming”, Prentice Hall India.