SEMMESTER I

CS601 - Mathematical Foundation for Computer Science

Credits: 3

Objectives

- To impart the fundamental concepts of logic, abstract algebra, and linear algebra.
- To impart probability, graph theory, etc.

Unit I Functional Logic


Unit II Combinatory and Probability


Unit III Algebraic Structures

Semi group - Monoid – Groups - Cyclic group - Permutation group(Sn and Dn) - Substructures - Homomorphism of semi group - monoid and groups - Cosets and Lagrange Theorem – Normal Subgroups - Rings and Fields.

Unit IV Recursive Functions, Graphs and Trees

Recursive functions - Primitive recursive functions - computable and non - computable functions - Graphs - Euler tours - planar graphs - Hamiltonian graphs - Euler's formula - applications of Kuratowski's theorem - graph colouring - chromatic polynomials – trees - weighted trees - the maxflow min-cut theorem.

Unit V Latticesand Complexity Classes

Partial order relation, poset - Lattices, Hasse diagram - Boolean algebra.- Turing Machines- Recursive and Recursively Enumerable languages. - Cantor’s Diagonalization theorem.- NP-Hard and NP-complete Problems - Cook's theorem NP completeness reductions.

Outcomes

- Ability to apply mathematical foundations in many areas of computer science like algorithms, computer networks, cryptography, etc.

Teaching and Evaluation guidelines

- 50% on Problems, and 30% on Theorems, and 20% on Proofs.

Text Books


References


CS603- ADVANCED DATA STRUCTURES AND ALGORITHMS

Credits: 3

Objectives
- To introduce and practice advanced algorithms and programming techniques necessary for developing sophisticated computer application programs.
- To impart various programming constructs such as divide-and-conquer, backtracking, and dynamic programming.
- To impart new techniques for solving specific problems more efficiently and for analyzing space and time requirements.

Unit-I Algorithmic Notations and Basic Data Structures

Unit-II Hashing and Binary Trees
Hashing: Direct access tables and hash tables - hash functions and relates analysis. Trees: Binary Search trees and Operations - AVL Trees and balancing operations - Red Black Trees and operations.

Unit-III Graph Algorithms

Unit-IV Concurrent Data Structures
Linked List- The Role of Locking- List Based Sets-Concurrent Reasoning-Coarse Grained Synchronization-Fine Grained Synchronization-Optimistic synchronization-Lazy Synchronization, Concurrent stacks and elimination.

Unit-V Algorithmic Paradigms
Algorithmic paradigms: Greedy Strategy - Dynamic programming - Backtracking - Branch and Bound - Randomized algorithms.

Outcomes
- Ability to understand techniques such as brute force, greedy, and divide and conquer.
- Ability to understand advanced Abstract Data Type (ADT) and data structures in solving real world problems.

Evaluation Guidelines
- 40% on Problems (Higher Order Thinking), and 40% on Comparisons and Statements (Medium Order Thinking), and 20% on Definitions (Lower Order Thinking).

Text Books

References
1. Research Papers published in IEEE, ACM, Elsevier publishers, etc.
Objectives

- To impart the characteristics of Operating System (OS) in Multiprocessor and Multicomputer.
- To impart the issues related to designing OS.
- To impart the latest trends in building Mobile OS.

Unit-I Multiprocessor Operating Systems

Unit-II Distributed Operating Systems

Unit-III UNIX Processes

Unit-IV Process Control and Signals

Unit-V Daemon Processes and Inter Process Communication

Outcomes

- Ability to understand advanced concepts in OS
- Ability to develop OS for distributed systems
- Ability to develop modules for mobile devices

Evaluation Guidelines

- 30% on Design(Higher Order Thinking), and 40% on Architecture, Structure, and Models (Medium Order Thinking) and 30% on Techniques(Lower Order Thinking).

Text Books

References
2. Research Papers published in IEEE, ACM, Elsevier publishers, etc.
CS607- ADVANCED NETWORK PRINCIPLES AND PROTOCOLS

Credits: 3

Objectives
- To impart the architecture of the Internet protocols as a layered model.
- To impart the fundamentals of data transmission, encoding, multiplexing.
- To impart the various components of wide area networks and local area networks work together

Unit-I Introduction and Data link Layer

Unit-II Network Layer Issues and Protocols

Unit-III Advanced Network Layer Protocols

Unit-IV Transport Layer Issues and Protocols

Unit-V Application Layer Issues and Protocols

Outcomes
- Ability to understand the different layers of TCP/IP protocol stack
- Ability to analyze the working principle of different protocols at different layers

Teaching and Evaluation Guidelines
- 20% on Synthesis (Higher Order Thinking), 40% on Analysis (Medium order Thinking) and 40% on Conceptual understanding (Lower Order Thinking).

Text Books

Reference Book
CS609-NETWORK PROGRAMMING LABORATORY

Credits: 2

Objectives
- To impart client and server applications using the "Sockets" API and the implementation of Data link layer protocol and TCP layer.
- To impart computer communication network simulations.
- To impart modeling techniques using OPNET or NS-2 simulation software.

Experiments
- Exercises on Socket Programming using Java.
- Exercises using NS3 Network Simulator.
- Setting up of various network topologies.
- Implementation of various MAC protocols.
- Measurement of routing protocols.
- Analysis of TCP/IP protocol under various mechanisms.
- Setting up network that carries various application protocols and analyzing the performances.
- Analyzing the various performance metrics for different application protocols.

Outcomes
- Ability to understand the working principle of Socket programming.
- Ability to work with the simulators such as OPNET or NS-2 toolkit.

References
CS611 - ADVANCED PROGRAMMING LABORATORY

Credits: 2

Objectives
- To impart the features of object oriented programming.
- To impart various programming constructs.
- To impart the OS internals.

Experiments
- Exercises using Linux tools – Grep, awk, tr
- Exercises using Linux IPC and system calls
- Exercises in Python/C++/ Java

Outcomes
- Ability to develop shell scripts for various applications.
- Ability to gain in-depth knowledge about OS internals.
- Ability to understand Object oriented concepts and developing software modules.

References
5. Research Papers published in IEEE, ACM, Elsevier publishers, etc.
SEMESTER-II

CS602- ADVANCED DATABASE MANAGEMENT SYSTEM  

Credits: 3

Objectives

- To impart the basic concepts and terminology related to DBMS and Relational Database Design
- To impart advanced DBMS techniques to construct tables and write effective queries, forms, and reports
- To impart the concept of a database transaction and related database facilities, including concurrency control, journaling, backup and recovery, and data object locking and protocols.

Unit-I Introduction

Formal review of relational database and FDs Implication – Closure - its Correctness.

Unit-II Basic Algorithms

3NF and BCNF - Decomposition and synthesis approaches - Review of SQL99 - Basics of query processing - external sorting - file scans.

Unit-III Advanced Concepts


Unit-IV Lock Based Protocols

Correctness of interleaved execution- Locking and management of lock - 2PL – deadlocks - multiple level granularity - CC on B+ trees - Optimistic CC.

Unit-V Log Based Recovery and Database System Architectures

T/O based techniques- Multiversion approaches- Comparison of CC methods- dynamic databases- Failure classification- recovery algorithm- XML and relational databases- Parallel databases - Emerging database applications -Recent trends and developments.

Outcomes

- Ability to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries.
- Ability to understand the file organization, Query Optimization, Transaction management, and database administration techniques

Evaluation Guidelines

- 30% on Application (Higher Order Thinking), 50% on Problems and Analysis (Medium Order Thinking) and 20% on Models and Architecture (Lower Order Thinking).
Text Books

References
1. Research Papers published in IEEE, ACM, Elsevier publishers, etc.
CS604 - SEMINAR AND TECHNICAL WRITING

Credits: 2

Objectives
- To develop soft skill.
- To understand research papers and prepare presentation material.
- To improve oral communication skills through presentation.
- To prepare original technical write upon the presentation.

Methodology
- To choose the area of interest.
- To identify current literatures.
- To choose state of the art survey paper/research paper.
- To consult and get confirmed with Seminar Coordinator.
- To prepare the PowerPoint presentation on recent trends.
- To present as per schedule drawn by Seminar Coordinator.
- To prepare a technical write-up and submit to Seminar Coordinator.
- To attend Guest lecturers/Seminars and submit the report.

Outcomes
- Improvement in proficiency in English.
- Improvement in presentation skill.
- Improvement in analytical and reasoning ability.
- Improvement in technical writing.

References
1. Research Papers published in IEEE, ACM, Elsevier publishers, etc.
CS606- ADVANCED DBMS LABORATORY

Credits: 2

Objectives
- To explore the features of a Database Management Systems.
- To interface a database with front end tools.
- To impart the internals of a database system.

Experiments
- Basic SQL.
- Intermediate SQL.
- Advanced SQL.
- ER Modeling.
- Database Design and Normalization.
- Accessing Databases from Programs using JDBC.
- Building Web Applications using PHP & MySQL.
- Indexing and Query Processing.
- Query Evaluation Plans.
- Concurrency and Transactions.
- Big Data Analytics using Hadoop.

Outcomes
- Ability to use databases for building web applications.
- Ability to gain knowledge on the internals of a database system.

References
3. Research Papers published in IEEE, ACM, Elsevier publishers, etc.
SEMESTER III

CS613- INTERNSHIP

Credits: 2

Objectives
- To develop institute-industry interaction.
- To know the industry practices.
- To understand cutting edge technology in the chosen area.

Methodology
- To identify industries offering internship by Training and Placement Office.
- To identify industries offering internship by students in consultation with the Internship Coordinator (Faculty) and Training and Placement Office.
- To avail during summer vacation (not more than 3 months).
- To submit a report based on the work done during internship to the Internship Coordinator.

Outcomes
- Exposure to industry practices.
- Strengthened institute-industry relationship.
- Bridging academic knowledge with industry input.
SEMESTER I

ELECTIVES
CS651 - CLOUD COMPUTING

Credit: 3

Objectives

- To impart an in-depth and comprehensive knowledge of the Cloud Computing.
- To impart the frontier areas of Cloud Computing.

Unit-I Introduction to Computing

Unit-II Introduction to Cloud Computing

Unit-III Cloud Services
Service models- Infrastructure as a Service (IaaS) – Resource Virtualization: Server, Storage – Network – Case studies - Platform as a Service (PaaS) – Cloud platform & Management: Computation, Storage – Case studies. - Software as a Service (SaaS) – Web services- Web2.0- Web OS – Case studies – Anything as a service (XaaS).

Unit-IV Cloud Programming and Software Environments

Unit-V Cloud Access

Outcomes

- Ability to explain the core issues of cloud computing such as security, privacy and interoperability.
- Ability to provide the appropriate cloud computing solutions and recommendations according to the applications used.

Teaching and Evaluation guidelines

- 50% on Analysis (Higher Order Thinking), and 30% on Paradigms (Medium Order Thinking), and 20% on Terms and Terminologies (Lower Order Thinking)
Text Book

Reference Books
Objectives

- To impart basic algorithms for computer graphics and image processing.
- To impart various filters, Point processing, and Arithmetic operations in image processing.

Unit-I Graphics System and Graphical User Interface


Unit-II Geometric Display Primitives and Attributes


Unit-III Digital Image Fundamentals


Unit-IV Image Enhancement and Restoration


Unit-V Image Segmentation and Recognition


Outcomes

- Ability to create software tools for Games and Animation
- Ability to understand Computer Graphics and Image Processing Techniques

Evaluation Guidelines

- 50% on Applications, and 30% on Comparisons and Statements, and 20% on Definitions.

Text Book


Reference Book

CS655 - OPEN SOURCE PROGRAMMING

Credits: 3

Objectives

- To impart Open Source Programming concepts.
- To impart applications based on Open Source Soft wares.

Unit-I Introduction
Introduction to open source programming languages: advantages and drawbacks - threats and vulnerabilities - Introduction to shell programming. Operating System – Linux.

Unit-II PHP

Unit-III Web Database Applications
Three-tier architecture - Introduction to Object oriented programming with PHP 5. Database basics: MYSQL - querying web databases - writing to web databases - validation with Javascript - Form based authentication - protecting data on the web.

Unit-IV PERL, TCL  and PYTHON
PERL: Numbers and Strings- Control Statements- Lists and Arrays- Files- Pattern matching-Hashes- Functions. Introduction to TCL/TK - Introduction to Python.

Unit-V Security in Web Applications

Outcomes

- Ability to develop codes in open source web applications.
- Ability to understand the risks associated with the open source Codes and CGI scripts.

Evaluation guidelines

- 40% on Analysis and synthesis (Higher Order Thinking), 30 % on Application (Medium Order Thinking), and 30% on knowledge and comprehension (Lower Order Thinking).

Text Book


References

1. Research Papers published in IEEE, ACM, Elsevier publishers, etc.
CS657 - ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Objectives

● To impart intelligent systems in e-learning, e-commerce, tele-medicine, automation, and bio-technology industries
● To impart an expert system using appropriate knowledge based software tools

Unit-I Overview of Artificial Intelligence
Definition and Importance of Knowledge - Knowledge Based Systems - Representation of Knowledge - Knowledge Organization - Knowledge Manipulation, and Acquisition of Knowledge– Introduction to LISP – PROLOG – Syntax and Functions.

Unit-II Dealing with Inconsistencies and Uncertainties
Introduction. Truth Maintenance Systems - Default Reasoning and the Closed World Assumption - Predicate Completion and Circumscription - Modal and Temporal Logics

Unit-III Search and Control Strategies

Unit-IV Knowledge Representation

Unit-V Knowledge Organization and Management

Evaluation guidelines

● 50% on Analysis, and 30% on Systems and Models, and 20% on Tools and Terminologies.

Outcome

● Ability to design, build, and implement an expert system and to provide solutions to real world problems

Text Book

Reference Book
CS659 - DATA WAREHOUSING AND DATA MINING

Credit: 3

Objectives
- To impart the principles of Data warehousing and Data Mining.
- To impart the various Data preprocessing Methods.

Unit-I Data Warehousing and Business Analysis

Unit-II Data Mining

Unit-III Classification and Prediction

Unit-IV Cluster Analysis

Unit –V Mining Object, Spatial, Multimedia, Text and Web Data
Multidimensional Analysis and Descriptive Mining of Complex Data Objects. Spatial Data Mining Multimedia Data Mining. Text Mining. Mining the WWW.

Outcome
- Ability to understand Data Mining principles and techniques for real time applications.

Teaching and Evaluation Guidelines
- 40% on Analysis, Evaluation and synthesis (Higher Order Thinking), and 30% on Application (Medium Order Thinking), and 30% on Knowledge and Comprehension (Lower Order Thinking).
Text Book

Reference Books
CS661 – INTERNET OF THINGS (IoTs)  

Credits: 3

Objectives
- To have a grasp on Data and Knowledge Management and use of Devices in IoT Technology
- To understand State of the Art – IoT Architecture
- To understand real world IoT Design constraints
- To study the security and privacy issues in IoT

Unit-I Introduction

Unit-II IoT Architecture
Traditional TCP/IP protocol stack and IoT Protocol Stack – Data Formats – Representational State Transfer (REST) and activity streams – Business Aspects and models

Unit-III IoT Communication
Fundamentals- Devices and gateways, Local and wide area networking, Data management, Communication protocols – Constrained Application Protocol (CoAP), Web Socket, PUSH - Everything as a Service (XaaS), Knowledge Management.

Unit-IV IoT Implementation and Security

Unit- V Case Study and implications

Outcomes
- Working ability with Raspberry Pi
- Demonstration of real world IoT application
- To analyze the security constraints in IoT applications

Teaching and evaluation guidelines
- 40% on Design, 40% on Comparisons and Statements, 20% on Techniques and Definitions

Textbook
Reference Books
SEMESTER II ELECTIVES
CS62 - DISTRIBUTED SYSTEMS

Credit: 3

Objectives
- To impart broad and up-to-date coverage of the principles and practice in the area of Distributed Systems.
- To understand the heterogeneous systems and their functionalities.

Unit-I Basic Concepts

Unit-II Distributed Objects and Process

Unit-III Operating System Issues
Distributed file systems - Name services, Domain name system, Directory and discovery services, Peer to peer systems, Napster file sharing system, Peer to peer middle ware routing overlays – Clocks, Events and process states. Clock Synchronization : Logical clocks - Global states. Distributed debugging. Distributed mutual exclusion: Elections. Multicast communication.

Unit-IV Distributed Transaction Processing

Unit-V Distributed Algorithms

Outcomes
- Ability to develop skill set in developing a distributed system.
- Ability to design and evaluate and protocols for various distributed systems.
Teaching and Evaluation Guidelines

- 30% on Problems and Analysis (Higher Order Thinking), and 30% on Application (Medium Order Thinking), and 40% on Conceptual Understanding (Lower Order Thinking).

Textbooks

References
1. Research Papers published in IEEE, ACM, and Elsevier publishers
Objective

- To impart about parallel computing models, design and analyze parallel algorithms for PRAM machines and Interconnection networks.

Unit-I Models of Computer


Unit-II Selection and Sorting

Selection: broadcast- all sums- parallel selection. Searching a random sequence - sorted sequence on PRAM models – Tree and Mesh.

Unit-III Merging


Unit-IV Matrix Operations


Unit-V Graphs


Outcome

- Ability to design and analyze parallel algorithms

Teaching and Evaluation guidelines

- 50% on Problems (Higher Order Thinking), and 30% on Comparisons, Issues, and Analysis (Medium Order Thinking), and 30% on Definition (Lower Order Thinking).

Text Book


References

CS656 - WIRELESS SENSOR NETWORKS

Credits: 3

Objectives
- To impart the fundamentals of wireless sensor networks and its application to critical real time scenarios.
- To impart the various protocols at various layers and its differences with traditional protocols.

Unit-I Introduction

Unit-II Introduction to adhoc/sensor networks
Key definitions of adhoc / sensor networks - unique constraints and challenges - advantages of ad-hoc/sensor network - driving applications - issues in adhoc wireless networks - issues in design of sensor network - sensor network architecture - data dissemination and gathering.

Unit-III MAC Protocols
Issues in designing MAC protocols for adhoc wireless networks – Design Goals- Classification of MAC protocols - MAC protocols for discovery- sensor networks – location- quality - other issues - S-MAC - IEEE 802.15.4

Unit- IV Routing Protocols
Issues in designing a routing protocol - Classification of routing protocols – Types: Table-driven - On-Demand – Hybrid – Flooding – Hierarchical - power aware routing protocols.

Unit-V QoS and Energy Management

Outcomes
- Ability to build a WSN network.
- Ability to analyze the critical parameters in deploying a WSN.
- Ability to understand various routing protocols at different layers.

Evaluation guidelines
- 50% on Analysis and Evaluation, and 30% on Techniques and Methods, and 20% on Theorems and Terminologies.

Text Book

Reference Book
CS658 - REAL TIME SYSTEMS

Credits: 3

Objectives
- To impart issues related to the design and analysis of systems with real-time constraints.
- To impart the various Uniprocessor and Multiprocessor scheduling mechanisms.
- To impart on various real time communication protocols.
- To study the difference between traditional and real time databases.

Unit-I Introduction – Real time systems

Unit-II Real time Programming languages and Databases

Unit-III Real time Communication
Introduction - Network topologies and architecture issues – protocols – contention based, token based, stop-and-go multi hop protocol, polled bus, hierarchical round robin, deadline based protocol, fault tolerant routing - RTP and RTCP.

Unit-IV Fault-Tolerance Techniques

Unit-V Reliability Evaluation Techniques and Clock Synchronization
Obtaining parameter values – Reliability model for hardware redundancy – Software error models – Clocks – A Non fault Tolerant synchronization algorithm - Impact of faults - Fault tolerant synchronization in hardware – Synchronization in software.

Outcomes
- Ability to learn Real-time programming environments.
- Ability to develop real time systems.

Evaluation guidelines
- 50% on Problems , and 30% on Algorithms, and 20% on Terms and Terminologies.

Text Book

References
2. Research Papers published in IEEE, ACM, Elsevier publishers, etc.
CS660 – MOBILE NETWORK SYSTEMS

Objectives
- To impart the fundamentals of Mobile communication systems.
- To impart the significance of different layers in mobile system.

Unit-I Introduction
Introduction to wireless: mobile and cellular mobile systems -cellular mobile telephone systems. Analog and digital cellular systems: frequency reuse - co-channel interference.

Unit-II Medium Access Control (MAC)

Unit-III Communication Systems

Unit-IV Mobile Network Layer
Network support for mobile systems – Mobile IP- IP packet delivery- Agent discovery- tunneling and encapsulation, reverse tunneling, IPV6, DHCP.

Unit-V Mobile Transport Layer
Mobile transport and application layer protocol – Review of traditional TCP, fast re-transmit / fast recovery, transmission/timeout freezing, filesystems, WWW,WAP.

Outcome
- Ability to apply knowledge in application and protocol development.

Teaching and Evaluation guidelines
30% on Synthesis (Higher Order Thinking), and 30% on Application (Medium Order Thinking), and 40% on Conceptual Understanding (Lower Order Thinking)

Text Book

References
CS662 - NETWORK SECURITY

Credit: 3

Objectives

- To impart the network security, services, attacks, mechanisms, types of attacks on TCP/IP protocol suite.
- To impart network layer security protocols, Transport layer security protocols, Web security protocols.
- To impart the wireless network security threats.

Unit –I Introduction Overview

Unit-II Authentication Algorithms and Protocols

Unit-III Network Security and Web Security Protocols

Unit-IV Software Attacks and Security
Intruders -Viruses - Worms - Trojan horses - Distributed Denial-Of-Service (DDoS) - Honey nets and Honey pots. Security Systems: Firewalls – IDS.

Unit-V Wireless Security

Outcomes:

- Ability to assess an appropriate mechanism for protecting the network.
- Ability to design a security solution for a given system or application.

Teaching and Evaluation Guidelines:

- 30% on Problems (Higher Order Thinking), and 30% on Comparisons and Statements (Medium Order Thinking), and 40% on Conceptual understanding (Lower Order Thinking).

Text Books


References
CS664 - MACHINE LEARNING TECHNIQUES
Credits : 3

Objectives

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms

Unit I Introduction

Unit II Linear Models

Unit III Tree and Probabilistic Models

Unit IV Dimensionality Reduction and Evolutionary Models

Unit V Graphical Models
Outcomes:
- Distinguish between, supervised, unsupervised and semi-supervised learning
- Apply the apt machine learning strategy for any given problem
- Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem
- Design systems that uses the appropriate graph models of machine learning
- Modify existing machine learning algorithms to improve classification efficiency

Teaching and Evaluation guidelines
- 50% on An Application (Higher Order Thinking), and 30% on Methods and Techniques (Medium Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Text Books:

References:
CS666 - INFORMATION RETRIEVAL TECHNIQUES

Credits: 3

Objectives:

- To learn the concepts behind IR.
- To understand the operation of web search.
- To learn the algorithms related to text classification, indexing and searching.

Unit I Introduction

Unit II Modeling and Retrieval Evaluation

Unit III Text Classification, Indexing and Searching

Unit IV Web Retrieval and Web Crawling

Unit V Types of IR and Applications
Outcomes:
- To use an open source search engine framework and explore its capabilities
- To represent documents in different ways and discuss its effect on similarity Calculations and on search
- To design and implement an innovative feature in a search engine

Teaching and Evaluation guidelines
- 50% on An Application (Higher Order Thinking), and 30% on Methods and Techniques (Medium Order Thinking), and 20% on Tool functions (Lower Order Thinking).

Text Books:

References: