SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING :: TIRUPATI – 517 502

Department of Computer Science and Engineering

B.Tech (CSE) – Choice Based Credit System – 2020 Regulations

Scheme of Instruction and Examinations

List of subjects for B.Tech (Minor) in Computer Science and Engineering**

(Effective from the batch of students admitted from the academic year 202021)

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits
		L	T	P	Total	
CSMN01	Data Structures	3	1		4	4
CSMN02	Computer Organization	3	1		4	4
CSMN03	Database Management Systems	3	1		4	4
CSMN04	Computer Networks	3	1		4	4
CSMN05	Software Engineering	3	1		4	4
CSMN06	Java and Web Technology	3	1		4	4

- All Courses - 40 marks (Internal) + 60 Marks (Univ. Semester End)

** Students shall register for any 4 subjects (4*4 = 16 credits) from the above listed subjects, choosing one subject each in IV, V, VI and VII semester. Further, they shall acquire 4 credits through two MOOCs (each of 2 credits), which shall be discipline-specific.

CSMN 01

SRI VENKATESWARA UNIVERSITY :: TIRUPATI

B.Tech (Minor in CSE) – CBCS Regulations-2020
(With effect from the academic year 2021-22)

DATA STRUCTURES

No.of Credits: 4 Instruction Hours/Week: 3L+1T

Course Objectives:

- Develop skills to design and analyze linear and nonlinear data structures.
- Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
- Develop recursive algorithms as they apply to trees and graphs.
- Strengthen the ability to identify and apply the suitable data structure for the given real world problem.
- Understand the various techniques of sorting and searching.

UNIT I

Introduction: Data types/Objects/Structures, Abstract definition of Data Structures, Overview of linear and nonlinear data structures, Analysis of algorithms, Algorithm specification, Asymptotic notation, Time-Space trade-off, Searching: Linear, Binary and Fibonacci search and their complexity analysis.

Arrays: Definition, Multidimensional arrays, Pointer arrays, Representation of arrays – Row major and Column major orders, Application of arrays – Polynomials, Sparse matrices representation.

UNIT II

Stacks and Queues: Introduction, ADT, Array Representation, Operations and Applications of Stacks - Evaluation of expressions, Code generation for stack machines, Implementation of recursion, Factorial calculation and Towers of Hanoi; Circular Queue, Priority Queue, Double ended queue, Applications of Queues - Simulation, CPU Scheduling; Multiple stacks and queues.

UNIT III

Linked Lists: Single linked lists and chains, Circular linked list, Doubly linked list, Circular doubly linked list, Complexity analysis of the same, Linked representation of Stacks and Queues, Applications of linked lists - Polynomial representation, Sparse matrix multiplication, Dynamic storage management; Generalized list representation, Recursive algorithms for lists, Recursive lists.

UNIT IV

Trees: Basic tree terminologies, Binary Trees – Definition, Properties, ADT, Representations, Operations and Applications; Binary Search Trees, Heap Trees, Threaded binary trees, Height balanced trees – AVL Trees, Red black tree, Splay tree Their operations and complexity analysis.

UNIT V

Sorting Techniques: Insertion sort, Selection sort, Bubble sort, Quick Sort, Radix sort, Merge sort, External sort – Introduction, K-way Merge sort.

Graphs: Basic terminologies, Representations, ADT, Operations on graphs – DFS, BFS, Spanning Trees, Biconnected components, Minimum cost spanning trees.

Course Outcomes:

After completion of the course the students will be able to

- Choose appropriate data structure for the specified problem definition.
- Implement linear and non-linear data structures viz. stacks, queues, linked list, trees, graphs.
- Apply the concept of trees and graph data structures for the real world problems.
- Comprehend the implementation of sorting and searching algorithms.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures", Computer Science Press.
2. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Fundamentals of Data Structures in C++, Universities Press, Second Edition.
3. Debasis Samanta, Classic Data Structures, Second Edition, Prentice Hall of India.

REFERENCES:

1. Aaron M. Tenenbaum Yedidyah Langsam. Moshe J. Augenstein, "Data Structures using C and C++", PHI Learning Private Limited.
2. Jean Paul Tremblay and Paul G Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill.
3. R. Kruse et.al, "Data Structures and Program Design in C", Pearson Education.

CSMN 02

SRI VENKATESWARA UNIVERSITY :: TIRUPATI

B.Tech (Minor in CSE) – CBCS Regulations-2020

COMPUTER ORGANIZATION

No.of Credits: 4 Instruction Hours/Week: 3L+1T

Course Objectives

The course is designed to

- make the students understand the basic structure and operations of various functional units of a digital computer.
- familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- Make the students understand how to design processing unit using hardwired control and microprogrammed control approaches.
- familiarize the students with hierarchical memory system.
- expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I

Structure of Computers: Introduction, Performance, Memory addressing and Operations, Instructions and Instruction sequencing, Addressing modes, Basic l/0 operations, Pushdown stacks, Subroutines, Encoding of machine instructions, Brief description and functional classification of IA-32 Pentium instruction set.

UNIT II

Basic Processing Unit: Fundamental concepts, Single and Multiple bus organization, Hardwired control, Multiprogrammed control – Microinstructions, Microprogram sequencing, Wide-branch addressing, Microinstructions with next-address field, Prefetching microinstructions.

Arithmetic: Multiplication – Booth algorithm; Integer division, Floating-Point Addition and Subtraction.

UNIT III

The memory System: Basic concepts, RAM and ROM Memories and their internal organization, Cache Memories - Mapping functions, Replacement algorithms; Performance Considerations, Virtual Memories, Secondary Storage.

UNIT IV

Input/ Output Organization: Accessing l/O devices; Interrupts –Enabling and disabling, Handling multiple devices; Direct Memory Access - Bus Arbitration; Buses – Synchronous and Asynchronous; Interface circuits – Parallel port, Serial port

UNIT V

Pipelining: Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Data path and control considerations, Superscalar operation.

Processor Families: The ARM family, The Motorola 680x0 and Coldfire families, The IA-32 family.

Course Outcomes:

On successful completion of this course the students will be able to

- Identify the basic structure and functional units of a digital computer.
- Analyze the effect of addressing modes on the execution time of a program.
- Design processing unit using the concepts of hardwired control or microprogrammed control.
- Select appropriate interfacing standards for I/O devices.
- Identify the roles of various functional units of a computer in instruction execution.
- Understand memory hierarchy and its impact on computer cost/performance.
- Understand the advantage of instruction level parallelism and pipelining for high performance processor design.

Text Books

1. Hamacher C, Vranesic Z, and Zaky S, Computer Organization, 5th edition, McGraw-Hill.

Reference Books

1. Heuring V P, and Jordan H F, Computer systems Design and Architecture Addison-Wesley.
2. Carpinelli J D, Computer System Organization and Architecture. Addison-Wesley 2001.
3. Mano M M, Computer system Architecture, 4th edition, Pearson Education Asian 2002.

CSMN 03

SRI VENKATESWARA UNIVERSITY :: TIRUPATI

B.Tech (Minor in CSE) – CBCS Regulations-2020

DATABASE MANAGEMENT SYSTEMS

No.of Credits: 4 Instruction Hours/Week: 3L+1T

Course Objectives:

- To learn data models, conceptualize and depict a database system using ER diagram
- To understand the internal storage structures in a physical DB design
- To demonstrate the fundamental concepts, operation and function of different components of database systems.
- To describe the roles of transaction processing and concurrency control in a modern DBMS.
- To demonstrate key issues in the operation of a DBMS including query processing, security and integrity.
- To design and implement a database application.

UNIT-I

Introduction: Managing Data, File Systems versus a DBMS, Advantages of a DBMS, Storing data in a DBMS, Queries in a DBMS, Transactions, Structure of a DBMS.

Introduction to Data base design: ER diagrams, Beyond ER Design, 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.

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

UNIT-II

Relational Algebra and Calculus: Relational Algebra , Relational calculus, Expressive Power of Algebra and calculus.

SQL: Form of Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, NULL values , Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases

UNIT-III

Schema Refinement and Normal Forms: Introduction, Functional Dependencies, Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms, BCNF, Properties of Decompositions, Normalization, Schema Refinement in Data base Design, Multi valued Dependencies , FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

Database Application Development: Accessing Databases from Applications, Introduction to JDBC, JDBC Classes and Interfaces, SQLJ, Stored Procedures.

UNIT-IV

Overview of Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-based Concurrency Control, Performance Locking, Transaction Support in SQL, Introduction to Crash Recovery.

Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking

Crash Recovery: Introduction to ARIES, Log, Recovery related Structures, Write-Ahead Log Protocols, Checkpointing, Recovering from a System Crash, Media Recovery, Interaction with Concurrency Control

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index data Structures, Comparison of File Organizations, Indexes and Performance Tuning.

Indexing and Hashing: Intuitions for tree indexes, Indexed Sequential Access Method, B+ Trees: A Dynamic Index Structure, Search, Insert, Delete, Duplicates, B+ Trees in Practice, Static Hashing, Extendable Hashing, Linear Hashing, Extendible vs. Linear Hashing.

Parallel and Distributed Databases: Introduction, Architectures for Parallel Databases, Parallel Query Evaluation, Parallelizing Individual Operations, Introduction to Distributed Databases, Distributed DBMS Architectures, Storing Data in Distributed DBMS, Distributed Catalog Management, Distributed Query Processing

Course Outcomes:

Upon successful completion of this course, the student should be able to

- Use relational algebra and relational calculus, to express database queries.
- Use SQL to interact with database management systems.
- Design appropriate database tables, using functional dependencies and normal forms.
- Implement a disk-oriented database storage manager with heap table and indexes.
- Understand, compare, and implement the major concurrency control algorithms.
- Implement database recovery algorithms and verify their correctness.
- Identify trade-offs among database systems techniques and contrast distributed/parallel alternatives for both on-line transaction processing and on-line analytical workloads.

Text Books:

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, Third Edition, McGraw-Hill, 2014.
2. C. J. Date, A. Kannan and S. Swamynathan, An Introduction to Database Systems, 8th edition, Pearson Education, 2006.

Reference Books:

1. Silberschatz A, Korth H F, and Sudarshan S, Database System Concepts, 6th edition, McGraw-Hill, 2011.
2. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems,

Fourth Edition, Pearson/Addision wesley, 2007.

3. J D Ullman, H. Garcia-Molina and J. Widom, Database Systems: The Complete Book, Prentice-Hall, 2009.
4. Jeffrey A. Hoffer, Ramesh Venkataraman, Heikki Topi, Modern Database Management, 12th edition, Pearson, 2015.

CSMN 04

SRI VENKATESWARA UNIVERSITY :: TIRUPATI

B.Tech (Minor in CSE) – CBCS Regulations-2020

COMPUTER NETWORKS

No.of Credits: 4 Instruction Hours/Week: 3L+1T

Course Objectives:

The course is designed to

- Provide insight about fundamental concepts, basic taxonomy and terminology of Computer Networks.
- Gain comprehensive knowledge about the principles, protocols, and significance of Layers in OSI and TCP/IP

UNIT I

Introduction to Computer Networks: Networks, Component and Categories, Topologies, Transmission Media, Reference Models: ISO/OSI Model and TCP/IP Model.

Physical Layer: Analog and Digital Signals, Periodic Analog Signals, Transmission Impairments, Data rate limits, Performance, Digital data transmission techniques, Analog data transmission techniques, Multiplexing: FDM, WDM and TDM; Spread Spectrum, Switching: Circuit and Packet.

UNIT II

Data Link Layer and Medium Access Sub Layer: Design Issues, Error Detection and Error Correction, Elementary Data Link Protocols, Sliding Window Protocols, Channel allocation problems, Multiple Access Protocols: Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA; IEEE 802.3 Ethernet.

UNIT III

The Network Layer: Network layer design issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP.

UNIT IV

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, Internet Transport Protocols: UDP, TCP; Network Performance Measurement.

UNIT V

The Application Layer: Introduction, Client-Server Programming, Domain Name System (DNS), WWW and HTTP, FTP, E-mail, TELNET, Secure Shell, SNMP, IP Security Architecture, Firewalls.

Text Books:

1. Computer Networks, Andrew S. Tanenbaum, Wetherall, Pearson, 5th edition, 2010.
2. Data communications and Networking, Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012.

Reference Books:

1. Kurose J F, Ross K W, *Computer Networking – A Top-Down Approach*, 5th edition, Pearson Education, 2010.
2. Peterson L L, Davie B S, *Computer Networks - A Systems Approach*, 5th edition, Morgan Kaufmann, 2011.
3. Forouzan B A, Mosharraf F, *Computer Networks – A Top-Down Approach*, Tata McGraw-Hill, 2012.
4. Olifer N, Olifer V, *Computer Networks – Principles, Technologies, and Protocols for Network Design*, Wiley, 2006.

Course Outcomes

By the end of this course students will be able to:

- Choose the transmission media depending on the requirements.
- Explain the functions of different layer of the OSI Protocol
- Analyze MAC layer protocols and LAN technologies
- Implement routing and congestion control algorithms
- Design new protocols for computer network.
- Configure DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls using open source software and tools.

CSMN 05

SRI VENKATESWARA UNIVERSITY :: TIRUPATI

B.Tech (Minor in CSE) – CBCS Regulations-2020

SOFTWARE ENGINEERING

No.of Credits: 4 Instruction Hours/Week: 3L+1T

Course Objectives:

The course is designed to understand

- Software life cycle models.
- Software requirements and SRS document.
- Different software design strategies
- Quality control and how to ensure good quality software.
- Planning and estimation of software projects.
- Maintenance of software and gain knowledge of the overall project activities.

UNIT I

Introduction to Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, Software Process, Software Engineering Practice, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

Agile Development: Agility, Agility and the Cost of Change, Extreme Programming, Agile Process Models

UNIT II

Understanding Requirements: Requirements Engineering, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirements Modeling: Requirements Analysis, Scenario based Modeling, Class based Modeling, Requirements Modeling Strategies, Flow Oriented Modeling, Patterns for Requirement Modeling, Requirements Modeling for WebApps

Design Concepts: Design Process, Design Concepts, Design Model.

Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Alternative Architectural Designs, Architectural Mapping using Data flow.

UNIT III

Component Level Design: Component, Class based Components, Conducting Component level design, Component level Design for WebApps, Designing Traditional Components, Component based Development.

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation.

Pattern Based Design: Design Patterns, Pattern based Software Design, Architectural Patterns, Component Level Design Patterns, User Interface Design Patterns.

UNIT IV

Software Quality Concepts: Software Quality, Software Quality Dilemma, Achieving Software Quality.

Software Quality Assurance: Elements of Software Quality Assurance, SQA Goals and Metrics, Formal Approaches to SQA, Statistical SQA, Software Reliability.

Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Unit Testing and Integration Testing (both Conventional and OO Software), Test Strategies for WebApps, Validation Testing, System Testing, Art of Debugging.

Testing Conventional Applications: Software Testing Fundamentals, Internal and External View of Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model based Testing, Testing for Specialized Environments, Patterns for Software Testing.

Computer Aided Software Engineering: CASE and its Scope, CASE Environment, CASE Support in Software Life Cycle, Characteristics of CASE Tools, Towards Second Generation CASE Tool.

UNIT V

Managing Software Projects: Project Management Concepts, Metrics in the Process and Project Domains, Software Measurement, Metrics for Software Quality, Project Planning Process, Software Scope and Feasibility, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Estimation for OO Projects, Project Scheduling – Basic Principles, Defining a Task Set and Task Network, Scheduling, Introduction to Risk Management, Software Maintenance, Software Supportability, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering, Economics of Reengineering.

Text Books:

1. Pressman R S, *Software Engineering: A Practitioner's Approach*, 7th edition, McGraw-Hill, 2010.
2. Sommerville I, *Software Engineering*, 9th edition, Pearson Education, 2011.

Reference Books:

1. Jalote P, *Software Engineering: A Precise Approach*, Wiley, 2010.
2. Braude E J, Bernstein M E, *Software Engineering: Modern Approaches*, 2nd edition, Wiley, 2010.
3. Saleh K A, *Software Engineering*, J Ross Publishing, 2009.
4. Bruegge B, Dutoit A H, *Object-Oriented Software Engineering Using UML, Patterns, and Java*, 3rd edition, Prentice Hall, 2009.
5. Bennett S, McRobb S, Farmer R, *Object-Oriented System Analysis and Design Using UML*, 4th edition, McGraw-Hill, 2010.
6. Lethbridge T C, Laganiere R, *Object-Oriented Software Engineering*, 2nd edition, McGraw-Hill, 2005.

Course Outcomes

By the end of this course students will be able to

- Define and develop a software project from requirement gathering to implementation.
- Obtain knowledge about principles and practices of software engineering.
- Focus on the fundamentals of modeling a software project.

- Obtain knowledge about estimation and maintenance of software systems
- Comprehend, assess, and calculate the cost of risk involved in a project management
- Implement testing methods at each phase of SDLC

CSMN 06

SRI VENKATESWARA UNIVERSITY :: TIRUPATI

B.Tech (Minor in CSE) – CBCS Regulations-2020

JAVA AND WEB TECHNOLOGY

No.of Credits: 4 Instruction Hours/Week: 3L+1T

Course Objectives:

The course is designed to

- Learn how to extend Java classes with inheritance and dynamic binding.
- Learn how to use exception handling in Java applications.
- Understand how to design applications with threads in Java.
- Learn how to design a graphical user interface (GUI) with Java Swing.
- Understand how to use Java APIs for program development.
- Understand the Web designing using HTML, XML, DHTML and Javascript

UNIT I

Core Java Programming: Introduction to Java programming; Object-oriented programming with Java Classes and Objects, Constructors; Overloading Methods and Constructors, this keyword, Garbage Collection, Type Conversion and Casting, Control Statements, Parameter Passing, Recursion, String Class and String handling methods.

Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class.

UNIT II

Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.

Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.

UNIT III

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

Working with types: Wrapper classes; Autoboxing, Generics.

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.

Applets; Event Handling; Basics of AWT and Swing; Basic concepts of networking.

UNIT IV

HTML: HTTP and HTML: Berners-Lee’s Basics, The Request/Response Procedure, The Benefits of HTML5, Introduction to elements of HTML, Working with Text, List, Tables, Images, Forms, Frames, Hyperlinks, Images and Multimedia.

CSS: Introduction, Importing a Style Sheet, Using IDs, Using Classes, Using Semicolons, CSS Rules, Style Types, CSS Selectors, The CSS Cascade, Measurements, Fonts and

Typography, Managing Text Styles, CSS Colors, Positioning Elements, Pseudo-Classes, Shorthand Rules, The Box Model and Layout, Attribute Selectors, The box-sizing Property, CSS3 Backgrounds, Multiple Backgrounds, CSS3 Borders, Text Effects.

UNIT V

XML - Document type definition, XML Schemas, Document Object Model.

Java Script - Control statements, Functions, Arrays, Objects, Events, Dynamic HTML with Java Script.

Web servers – IIS, Apache and Apache Tomcat Servers.

Database Connectivity with MySQL - JDBC, Servlets.

Course Outcomes:

After completion of the course the students will be able to

- Write GUI programs using swing controls in Java.
- Write multithreaded programs.
- Design and develop dynamic and interactive web sites.
- Handle Java Database Connectivity with MySQL.

Text Books:

1. Herbert Schildt, Java - The Complete Reference, Mcgraw Hill Education, Ninth Edition, 2014.
2. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, “Internet & World Wide Web How to Program”, Deitel Series, Fifth edition, 2012.
3. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5, O’Reilly, Third Edition, 2014.

Reference Books:

1. Paul Dietel, Harvey Dietel, Java How to Program, Pearson Education, Eleventh Edition, 2017.
2. Jennifer Niederst Robbins, Learning Web Design: A Beginner’s Guide to HTML, CSS, Javascript, and Web Graphics, O’Reilly, Fifth Edition, 2018.
3. Jim Keogh, J2EE - The complete Reference, First Edition, McGraw Hill Education, 2017.
4. Robert W. Sebesta, “Programming the World Wide Web”, Pearson, Fourth edition, 2008.
5. David William Barron, “The World of Scripting Languages”, Wiley Publications, 2000.
6. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wiley India, 2009.
7. Rob Larsen, Beginning HTML & CSS, John Wiley & Sons, Inc, 2013.
8. M. Srinivasan, Web Technology: Theory and Practice, Pearson, 2012.