Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering)

Academic Semester III

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/ 2 (L+P+T)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE301	MATH	Discrete Mathematics	3	1	0	30	20	50	100	4
2	SOE-B-CSE302	CSE	Internet Technology	2	1	0	15	10	25	50	3
3	SOE-B-CSE303	CSE	Data Structure	3	1	0	30	20	50	100	4
4	SOE-B-CSE304	CSE	Operating System	2	1	0	20	15	40	75	3
5	SOE-B-CSE305	SoM	Basics of Banking and Financial Service	2	0	0	15	10	25	50	2
6	SOE-B-CSE306	Civil	Disaster Management	1	0	0	15	10	25	50	1
7	SOE-B-CSE307	CSE	Internet Technology Lab	0	0	4	0	50	25	75	2
8	SOE-B-CSE308	CSE	Data Structure Lab	0	0	2	0	30	20	50	1
9	SOE-B-CSE309	CSE	Operating System Lab	0	0	2	0	30	20	50	1
10	SOE-B-CSE310	CSE	Data Analytics with Python	0	0	4	0	50	25	75	2
11	SOE-B-CSE311	CSE	Seminar /Case Study	0	0	2	0	15	10	25	1
12	SOE-B-CSE312	Humanities	Professional Development-III	0	0	2	0	30	20	50	1
TOTAL				**13**	**4**	**16**	**125**	**290**	**335**	**750**	**25**

* End Semester Examination

** Progress Review Examination

Semester: III **Branch: Computer Science & Engineering**
Subject: Discrete Mathematics **Code: SOE-B-CSE301**

Course Description

This course will discuss fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science. Example topics include logic and Boolean circuits; sets, functions, relations, databases and finite automata; deterministic algorithms and randomized algorithms; analysis techniques based on counting methods and recurrence equations, trees and more general graphs.

Course Objectives

- To understand the basic terminology of functions, relations and sets
- To perform the operations associated with the sets, functions and relations
- To relate practical examples to the appropriate set, function or relation model and interpret the associated operations and terminology in context
- To describe the importance and limitations of predicate logic
- To relate the ideas of mathematical induction to recursion and recursively defined functions
- To use Graph Theory for solving problems

Syllabus:

Unit I: Mathematical Logic

Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers, Predicates: Predicate logic, Free and Bound variables, Rules of Inference, Consistency, proof of contradiction, Automatic Theorem Proving

Unit II: Relation

Properties of Binary relations, equivalence, transitive closure, compatibility and partial ordering of relations, Lattices, Hasse diagram, Functions: Inverse functions, composition of functions, recursive functions, Lattice and its properties, Semi groups and monads, groups homomorphism, Isomorphism.

Unit III: Graph Theory

Notations and Terminology, directed and undirected graphs, incidence and degrees, sub-graphs, walk paths, cycles, circuits, components, connectedness algorithms, shorter path algorithms, Euclidian and Hamiltonian graphs, the travelling salesman problem, Trees: spanning trees, rooted trees and binary trees

Unit IV: Function

Discrete numeric functions, generating functions, recursion and recurrence relation, many faces of recursion, sequences solving a recurrence relation including non-homogeneous finite order linear relations.

Unit V: Coding Theory

Coding theory, binary symmetric channel, coding process, decoding, error detection and correction codes, Vector spaces: Linear independence, bases, subspaces, dimensionality, linear mapping, linear in-equality, inner products, norms

Course Outcomes

- After completion of the course, students may be able to formulate logic expression for variety of applications
- To use variety of data structure to formulate computational problems
- To develop application in the area of data structure, theory of computer languages, analysis of algorithms

Text Books

- Applied Discrete Structures for computer science by A. Doerr and K. Levasser
- Discrete Mathematical Structures for computer science by B. Kolman and R.C. Busby

Reference Books

- Discrete mathematical structures with application to computer science by J.P. Trembley and R.P. Manohar
- Graph Theory by F. Harary
- Elements of Discrete Mathematics by C. Liu

Semester: III **Branch: Computer Science & Engineering**
Subject: Internet Technologies **Code: SOE-B-CSE302**

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Course Description:

The aim of this course is to provide the conceptual and technological developments in the field of Internet and web designing with the emphasis on comprehensive knowledge of Internet, its applications and the TCP/IP protocols widely deployed to provide Internet connective worldwide. The World Wide Web with its widespread usefulness has become an integral part of the Internet. Therefore, this course also puts emphasis on basic concepts of web design.

Course Objectives:

- Examine and critique some of the most important technologies that are being used today by web developers to build a wide variety of web applications.
- Review the current topics in Web & Internet technologies.
- Describe the basic concepts for network implementation.
- Learn the basic working scheme of the Internet and World Wide Web.
- Understand fundamental tools and technologies for web design.
- Comprehend the technologies for Hypertext Mark-up Language (HTML).
- Specify design rules in constructing web pages and sites.

Syllabus:

Unit-I: Internet Technology and Protocol:

Basics of Web and Network, Internet Protocols, FTP, HTTP, HTTPS, Email protocols – SMTP, POP3, IMAP4, MIME6, Router, E-mail Addresses, Resources Addresses, Application areas: E-commerce, Education Entertainment such as games and gambling, Impact of Internet on Society – Crime on/through the Internet.

Unit-II Introduction to Web Design:

Basic principles involved in developing a web site, Planning process, Five Golden rules of web designing, designing navigation bar, Page design, Home Page Layout, Design Concept, Designing Tools.

Unit-III: Web Systems Architecture:

Architecture of Web based systems- client/server (2-tier) architecture, 3-Tier architecture, Building blocks of fast and scalable data access: - Caches-Proxies-Indexes-Load Balancers- Queues, Web Application architecture (WAA), Web Platform Architecture (WPA)

Unit-IV: Web Servers:

Web servers –HTTP request types – System architecture – Accessing web servers- IIS – Apache web server. Search Engines, integrity of information, databases online.

Web Publishing and Browsing: Overview, Web hosting, Components of Web Publishing, Document management, Web Page Design, Consideration and Principles, Browser, HTTP, Publishing Tools.

Unit-V: Web Security:

Overview of Internet Security, Security policies / Privacy / Identification / Authentication / Access control. Hardware and software, Risk assessment, vulnerabilities. Threats and attack methods such as Viruses, Spam, Root kits, "phishing", Firewalls – spyware plug-ins.

Course Outcomes:

At the end of the course, the student would be able to:

- Develop proficiency in webpage development and website management
- Develop proficiency in creating dynamic Web Interface
- Write server and client sides scripts and manage websites
- Design a web page using image, audio and video editing tools

Reference Books:

- M. L. Young,"The Complete reference to Internet", Tata McGraw Hill, 2019.
- Godbole AS & Kahate A, "Web Technologies", Tata McGrawHill,2019.
- Jackson, "Web Technologies", Pearson Education, 2019.
- B. Patel & Lal B. Barik," Internet & Web Technology ", Acme Learning Publishers.
- Leon and Leon, "Internet for Everyone", Vikas Publishing House.
- Communicating Design: Developing Web Site Documentation for Design and Planning : Dan Brown.

Reference Link: -

- NPTEL - https://nptel.ac.in/courses/106/105/106105084/
- NIELIT - http://nielit.gov.in/chuchuyimlang/
- University of Mumbai - https://www.sfit.ac.in/pdf/IT/SE-BE-Information-Technology-Rev-2016%20TE.pdf
- University of New Hampshire - http://itcourses.cs.unh.edu/403/schedule
- University of Kentucky - https://ci.uky.edu/sis/sites/default/files/syllabi/Syllabus-LIS638-Internet%20Technologies%20and%20Information%20Services-0101_0.pdf

Semester: III **Branch: Computer Science and Engineering**
Subject: Data Structure **Code: SOE-B-CSE303**

Course Description:
This course emphasizes on logical structure of data, it's physical representation and techniques for program development and debugging. In this course, students will also learn how to select best suited data structure to solve a particular problem. This course is also about the computational complexities of different data structures.

Course Objectives:

- To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.
- To be able to carry out the analysis of Time and Space Complexity of different ADT.
- To learn how the choice of data structures and algorithm design methods impacts the performance of programs.
- Understand the data structure and its applications in context of the real world scenarios.

Syllabus:

Unit–I: Introduction

Introduction: Basic Terminology, Data types and its classification, Abstract Data Types. Time and Space Analysis of Algorithms, Asymptotic Notations - Average, best and worst case analysis, Simple recurrence relations and use in algorithms, Sorting and Searching algorithms.

Unit–II: Linear Data Structure:

Arrays, Stacks, Queues, Linked Lists Arrays, Sparse Matrices, Stacks, Recursion, Queues, Types of queues, linked list, Generalized linked list, Application: Garbage collection and compaction, Conversion of Infix to Postfix Expressions, Polynomial Arithmetic etc.

Unit–III: Non-Linear Data Structure:

Trees, Binary Trees, Tree Traversal, Threaded Binary trees, Binary Search Tree (BST), balanced trees - AVL Trees, B-trees, B+ tree. Application: Huffman coding Algorithm etc.

Unit-IV: Nonlinear Data Structure: Graphs

Graphs, Directed graph, Undirected graph, Traversal, Application of Graphs: Shortest path - Minimal spanning tree etc.

Unit–V: Hashing

Introduction, types, Collision Resolution Strategies, NP-completeness.

Course Outcomes:

Successful completion of the course, the student will able to:

- Identify the correctness of the algorithms.
- Analyze the times complexity of the algorithms using asymptotic analysis.
- Compare between different data structures. Pick an appropriate data structure for a design situation.
- Analyze/ summarize searching and sorting techniques.
- Employ and map suitable algorithms to solve engineering problems.

Text books:

- Alfred. V. Aho, John. E. Hopcroft, Jeffrey.D. Ullman, "Data Structures and Algorithms", Addison-Wesley Publications.,1985.
- Horowitz and Sahani, “Fundamentals of data Structures”, Galgotia Publication Pvt. Ltd., N Delhi.

Reference books:

- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, Asia.1994.
- Jean-Paul Tremblay, Paul. G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill second edition, 1991.
- Thomas. H. Cormen, Charles. E. Leiserson, Ronald. L. Rivest, "Introduction to Algorithms", PHI 1998.
- Lipschutz; Data structure (Schaum); TMH
- R. Kruse et al, “Data Structures and Program Design in C”, Pearson Education Asia, Delhi-2002.

Semester: III **Branch: Computer Science & Engineering**
Subject: Operating System **Code: SOE-B-CSE304**

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Course Descriptions:

This course will provide an introduction to operating system design and implementation. The course starts with evolution and then covers the major components of operating systems. The discussion will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping) and file systems. Linux / Unix is studied at the end as a case study.

Course Objectives:

- To learn the fundamentals of Operating Systems functions, features and services.
- To understand the concepts of process and resource management.
- To understand the memory hierarchy, memory technologies and memory management.
- To gain insight of Linux/Unix system.
- To know how operating system manages complexity through appropriate abstraction of CPU, memory, files, processes etc.

Syllabus:

Unit–I Operating System Introduction:

Operating systems objectives, functions, architecture, structures, operations, Evolution, services, Design and Implementation issues, System calls, System programs, Virtual machine. History of UNIX, Philosophy, Terminology, Distributions, Community

Unit-II Process Scheduling and Threads

Processes: Process Concept, Process States, Process State Transition Diagram, Process Control Block (PCB), Process Scheduling Concepts, Threads and their management.

Scheduling: Scheduling concepts, Performance criteria, Scheduling algorithms, Multiprocessor scheduling. Process management in Linux: Boot process, Init process, Foreground and Daemon process, Scheduling of processes at command

Unit-III Process Coordination:

Process Synchronization: Critical section problem, software and hardware solutions, semaphores, monitors, atomic transactions, classical synchronization problems. Deadlock: characterization, Prevention, Avoidance and Detection, Recovery, combined approach to handle deadlocks. Process Control in UNIX/Linux: Process abstraction, System Call: fork, wait etc. Process groups, Zombies and Orphans, Connecting processes, Signal handling

Unit-IV Memory and File Systems:

Memory Management: Virtual Memory Concepts, Partitioning, Cache memory File System: File concept, File organization and access mechanism, File directories, File allocation methods, Free space management. File and Directory System in UNIX/Linux: Directory types, mode, Opening and Closing files, Directory Navigation, File access rights, File sharing, Modifying file attributes.

Unit-V Security, Protection and Networking Tools

Introduction, Threats and attacks, Security violation through parameters, Computer virus and worms Security design principle, Authentication, Protection mechanisms, Data encryptions, Digital signature Networking in Linux: TCP/IP Basics, IP address resolving, SSH: Secure Shell, SSH Tools,

Course Outcomes:

At the end of the course students will:

- Gain an insight into how programming languages, operating systems, and architectures interact and provide an environment to the user
- Get an idea regarding tradeoffs that can be made between performance and functionality during the design and implementation of an operating system.
- Get knowledge about different functions of operating system i.e. Process Management, resource management
- Be able to conceptualize the components involved in designing a contemporary Operating system.
- Be able to understand the theoretical approaches and practical implementations of OS functionalities.

Text Books:

- Operating System Concepts, by Silberschatz and Galvin, Wiley India, 8th edition.
- Operating System, By William Stalling, Pearson Education, 6th edition.
- Unix Concepts and Applications by Sumitabha Das, TMH,4th Edition.

Reference Books:

- Modern Operating Systems, By Andrew S. Tanenbaum, Pearson Education, 4th Edition.

- Operating System, By Achyut S Godbole and Atul Kahate, TMH, 3rd edition.
- UNIX:The Complete Reference by Rosen and Kenneth, McGraw Hill,2nd Edition

Semester: III **Branch: Computer Science & Engineering**
Subject: Basics of Banking and Financial Services **Code: SOE-B-CSE305**

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Course Description:
Banking and Financial Services is a semester course (1/2 credit) where students develop knowledge and skills in the economic, financial, technological, international, social, and ethical aspects of banking to become competent consumers, employees, and entrepreneurs. Students incorporate a broad base of knowledge that includes the operations, sales, and management of banking institutions to gain a complete understanding of how banks function within society.

Course Objectives:
To impart knowledge about the basic principles of banking and Financial Services.

Syllabus:

Unit-I: Introduction

Origin of banking: definition, banker and customer relationship, General and special types of customers, Types of deposits, Origin and growth of commercial banks in India. Financial Services offered by banks, changing role of commercial banks, types of banks

Unit-II: Internet Banking

Meaning, Benefits, Home banking, Mobile banking, Virtual banking, E-payments, ATM Card/Biometric card, Debit/Credit card, Smart card, NEFT, RTGS, ECS (credit/debit), E-money, electronic purse/E-Wallets, Digital cash.

Course Outcomes:
At the end of the course, the student would be able: -

- To enable learners to know basics of International Banking and Finance
- To make them aware about basic terminology in Banking and Finance
- To make them understand about various foreign exchange across the globe.
- To identify the risk faced by the Industry and Banks in International Market.

Text Books:

- Parameswaran. R, Natrajan. S, Indian Banking System, S. Chand,2010
- Gordon and Natarajan - Financial Markets and Services, Himalaya Publication

Reference Books:

- Bhole and Mahakud, Financial Institutions and Markets, McGraw Hill Publications
- Jeff Madura - Financial Institutions and Markets, Cengage Publications.

Semester: III **Branch: Computer Science & Engineering**
Subject: Internet Technology Lab **Code: SoE-B-CSE307**

Course Description:
The following concepts will be covered in this Lab:

- Concepts of HTML, CSS, Java Script
- Concepts of Web server, Web Application, Web Architecture
- Development of dynamic webpage by the use of CSS, java script and HTML

Course Objectives:
The objective of this course, a student will be familiar with client server architecture and able to develop a web application using web technologies to create fully functional website/web application with MVC architecture.

Course Outcome:
At the end of the course, the student would be able: -

- Develop Static web based application.
- Implement client side scripting.
- Implement server side scripting.
- Develop dynamic web based application.

Text Books:

- Chris Bates, "Web Programming-Building Internet Applications", 2nd ed., Wiley Publishers, 2006.
- Diet eland Nieto, "Internet and World Wide Web-How to Program", 4th ed., PHI/ Pearson Education Asia,2007.

Reference Books:

- Hans Bergsten, "Java Server Pages", 1st ed., O'REILLYPublications,2000.
- Jennifer Niederst, Robbins, "Learning Web Design", 3rd ed., SPD O'REILLY Publications, 10.
- Firuza Aibara, "HTML for Beginners", 2nd ed., SPD O'REILLY Publications, 2010.
- Marty Hall, "Core Servlets and Java Server Pages", 1st ed., Prentice Hall PTR, 2000.
- The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH

Software Requirement:

- Web Browser: Microsoft Internet Explorer, Mozilla, Google Chrome
- Web Server: XAMPP, WAMP
- IDE: Adobe Dreamweaver, Notepad ++

Semester: III **Branch: Computer Science & Engineering**
Subject: Data Structure Lab **Code: SOE-B-CSE308**

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Course Descriptions:

The following concepts will be covered in this Lab:

- Implementations of different data structures Algorithms
- Programs on Disjoint Sets, Spanning Trees, Connected and Biconnected Components
- Applications of Sorting and Searching
- Greedy Method Examples
- Dynamitic Programming Method Examples
- Back Tracking Examples

Course Objectives:

The objective of this course is to enable the students:

List of Practical

- Operations on Linked Lists
- Operations on Linked Lists with Header node
- Programs on Implementations of Stacks and Queues
- Applications of Stacks and Queues
- Binary Tree Traversals (Recursive and Iterative)
- Operations on Search Trees
- Evaluation and conversations of Expressions
- Graph creation and representation
- DFS and BFS Sorting techniques

Course Outcomes:

At the end of the course, a student will be able to implement:

- Arrays, records, linked structures, stacks, queues, trees, and graphs, etc.
- Apply different data structures in real applications

Text Book

- Data Structures Using C and C++ by Langsam, Tanenbaum, Prentice Hall India Learning Private Limited; 2 editions.
- Data Structures, Schaum's Outlines Series, by Seymour Lipschutz
- Fundamentals of Data Structures in C, by Sahni Horowitz, Publisher: Universities Press; Second edition.

Reference Book

- Data Structures and Algorithms Made Easy, CareerMonk Publications; Second edition
- Data Structures and Algorithms in C++ 3rd Edition, by Adam Drozdek, Publisher: Course Technology; 3 editions.
- Data Structures & Algorithm Analysis in C++ 4th Edition, by Mark A. Weiss, Publisher: Pearson; 4 editions.

Semester: III **Branch: Computer Science & Engineering**
Subject: Operating System Lab **Code: SOE-B-CSE309**

Course Objectives:
The goal of this course is to have students understand and appreciate the principles in the design and implementation of operating systems software.

Course Descriptions:
Introduction to operating systems concepts, process management, memory management, file systems, virtualization, and distributed operating systems. The laboratory exercises will include familiarization with UNIX/Linux system calls for process management and inter-process communication; Experiments on process scheduling and other operating system tasks through simulation/implementation. Finally, the students would require to apply the operating system concepts by experimenting on Linux operating systems.

Course Outcome:
At the end of the course, the student would be able: -

- Perform task using useful linux commands
- Develop shell script

Text Books:

- Operating System, By William Stalling, Pearson Education, 6 th edition.
- Unix Concepts and Applications by Sumitabha Das, TMH,4 th Edition

Reference Books:

- Abraham Silberschatz Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley 8th Edition, 2008.
- Garry. J. Nutt, Operating Systems: A Modern Perspective, Addison-Wesley
- Andrew S. Tanenbaum and Herbert Bros, Modern Operating Systems (4th Edition), Pearson
- Russ Cox, Frans Kaashoek, Robert Morris, xv6: a simple, Unix-like teaching operating system & quot; Revision 8
- Sumitabha Das, UNIX Concepts and Applications, Tata McGraw-Hill

Software Requirement:

- Machine with Linux Operating System like Fedora, Ubuntu and Kaali Linux.

Semester: III **Branch: Computer Science & Engineering**
Subject: Data Analytics with python **Code: SOE-B-CSE310**

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Course Objectives:

The objective of this course is to enable the students to:

- Describe the syntax and semantics of Python programming language.
- Describe Data Analysis techniques and find meaningful insights from data using pandas Library.
- Describe Data Visualization using Matplotlib library.

Course Descriptions:

The following concepts will be covered in this Lab:

Introduction to Python:

Variables, Operators, Data Types, Indentation, Comments, Reading Input, Output, Type Conversions. If-else, Loops – For, while; break continue, String manipulations – Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, Formatting Strings, immutability, string functions and methods.

Python Building Blocks

Functions - Defining, invoking functions, passing parameters, Lists – list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, Tuples - tuple assignment, tuple as return value, Sets - Concept of Sets, creating, initializing and accessing the elements, operations, Dictionaries - Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, operations and methods, Modules - Importing module, Math module, Random module, Packages.

Numpy Array Creation and Manipulation:

Creating array 1d, 2D & multi-dimensional array, indexing and slicing, iterating over array, array manipulation, matrix library Modifying Parts of an Array, Adding a Row Vector to All Rows, Random Sampling

Introduction to Pandas:

creating a series, accessing elements from series, indexing and selecting data in series, Data frame-introduction, creating data frame by list and dictionaries, dealing with rows and column, indexing & selecting data (selecting single row and column by using indexing operator,.loc() and .iloc()) Python processing on csv file (input csv file, reading csv file, reading particular row and column)

Data Preparation and Data Cleaning with pandas:

Data preparation using pandas-parsing data, concatenating data, merging data, converting data types, duplicate and missing data, tidy data), Group by function.

Data visualization with Matplotlib:

Creating a chart and styling, creating box plot, Creating Line Plot, creating scatter plot, Creating Histogram using matplotlib, column chart, pie chart

Course Outcome:

The student will be able to:

- Create a python code using above techniques.
- understand and use python libraries as a tool for data analytics.
- create Data visualizations using python

Text Books:

- Python Programming: An Introduction to Computer Science, 3rd Edition by John Zelle (Author)
- Python Essential Reference: Developer's Library by David Beazley (Author)

Reference Books:

- Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython 2nd Edition by Wes McKinney (Author)

Software Requirement:

- Python 3.8
- Numpy
- Pandas
- Matplotlib
- Jupyter Notebook IDE