SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST322	Numerical Methods	BS	3	0	0	3	25	75	100
2	U20EST356	Data Structures	ES	3	0	0	3	25	75	100
3	U20EST359	Programming in C++	ES	3	0	0	3	25	75	100
4	U20ITT305	Computer Networks	PC	3	0	0	3	25	75	100
5	U20ITT306	Database Management Systems	PC	3	0	0	3	25	75	100
6	U20ITT307	Software Engineering and Project Management	PC	3	0	0	3	25	75	100
Practical										
7	U20HSP301	General Proficiency - I	HS	0	0	2	1	50	50	100
8	U20BSP323	Numerical Methods Laboratory	BS	0	0	2	1	50	50	100
9	U20ESP357	Data structures Laboratory	ES	0	0	2	1	50	50	100
10	U20ESP360	Programming in C++ Laboratory	ES	0	0	2	1	50	50	100
11	U20ITP303	Database Management System Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
12	U20ITC3XX	Certification Course - III**	EEC	0	0	4	-	100	-	100
13	U20ITS302	Skill Development Course 2*	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U20ITM303	Physical Education	MC	0	0	2	-	100	-	100
							23	700	700	1400

U20BST322	NUMERICAL METHODS (Common to CSE, IT, BME)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To know the solution of algebraic and transcendental equations.
- To learn the techniques of solving simultaneous equations.
- To introduce the numerical techniques of differentiation and integration.
- To solve ordinary differential equations by using numerical methods.
- To know the solution of partial differential equations by using numerical methods.

Course Outcomes

After completion of the course, the students will be able to

CO1 – Use of Numerical techniques to solve algebraic and transcendental equations. **(K2)**
CO2 – Find the solution of simultaneous equations. **(K2)**
CO3 – Apply the knowledge of differentiation and integration by using numerical methods. **(K3)**
CO4 – Solve the ordinary differential equations by using various methods. **(K3)**
CO5 – Solve the partial differential equations by numerical methods. **(K3)**

UNIT I SOLUTION OF ALGEBRAICAND TRANSCENDENTAL EQUATIONS AND EIGEN VALUE PROBLEMS **(12Hrs)**

Bisection method – Method of false position – Newton Raphson method – Eigen value and Eigen vector by power method.

UNIT II LINEAR SIMULTANEOUS EQUATIONS **(12 Hrs)**

Solution of linear simultaneous equations and matrix inversion – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.

UNIT III INTERPOLATION **(12 Hrs)**

Interpolation: Finite Differences – Relation between operators – Interpolation by Newton's forward and backward difference formula for equal intervals – Newton's divided difference method and Lagrange's method for unequal intervals – Differentiation based on finite differences – Integrations by Trapezoidal and Simpson's rules.

UNIT IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **(12 Hrs)**

Single step methods – Taylor series method – Picard's method – Euler and Improved Euler methods – Runge Kutta method of fourth order only.

UNIT V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS **(12 Hrs)**

Solution of Laplace and Poisson equations – Leibmann's iterative method – Diffusion equation: Bender-Schmitt method and Crank-Nicholson implicit difference method – Wave equation: Explicit difference method

Text Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., 7th Edition, 2019.

Reference Books

1. C. Xavier, "C Language And Numerical Methods", New Age International, 2007.
2. P. Siva Ramakrishna Das, "Numerical Analysis", Kindle Edition, 2016.
3. Timo Heister, Leo G. Rebholz, Fei Xue, "Numerical Analysisan Introduction", Publisher De Gruyter, 2019.
4. K. Sankara Rao, "Numerical Methods for Scientists and Engineers", PHI Learning Pvt.Ltd, New Delhi, 3rd Edition, 2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

U20EST356	DATA STRUCTURES	L	T	P	C	Hrs
		3	0	0	3	45

(Common to ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS,CCE)

Course Objectives

- To impart the basic concepts of data structures and its terminologies.
- To understand concepts about stack and queue operations.
- To understand basic concepts about linked list and its various operations.
- To understand concepts about Tree and its applications.
- To understand basic concepts about Sorting, Hashing and Graph.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Compute time and space complexity for given problems **(K3)**
CO2 - Demonstrate stack, queue and its operation. **(K3)**
CO3 - Illustrate the various operations of linked list. **(K3)**
CO4 - Use the concepts of tree for various applications. **(K3)**
CO5 - Outline the various sorting, hashing and graph techniques. **(K3)**

UNIT I BASIC TERMINOLOGIES OF DATA STRUCTURES **(9 Hrs)**

Introduction: Basic Terminologies – Elementary Data Organizations. Data Structure Operations: Insertion – Deletion – Traversal. Analysis of an Algorithm. Asymptotic Notations. Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques – Complexity analysis.

UNIT II STACK AND QUEUE OPERATIONS **(9 Hrs)**

Stacks and Queues: ADT Stack and its operations. Applications of Stacks: Expression Conversion and evaluation. ADT Queue and its operations. Types of Queue: Simple Queue – Circular Queue – Priority Queue – Deque.

UNIT III LINKED LIST OPERATIONS **(9 Hrs)**

Linked Lists: Singly linked list: Representation in memory. Algorithms of several operations: Traversing – Searching – Insertion – Deletion. Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.

UNIT IV TREES **(9 Hrs)**

Trees: Basic Tree Terminologies. Different types of Trees: Binary Tree – Threaded Binary Tree – Binary Search Tree – Binary Tree Traversals – AVL Tree. Introduction to B-Tree and B+ Tree.

UNIT V SORTING, HASHING AND GRAPHS **(9 Hrs)**

Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table – Hash Function and its characteristics. Graph: Basic Terminologies and Representations – Graph traversal algorithms.

Text Books

1. Ellis Horowitz, Sartaj Sahni,"Fundamentals of Data Structures", Computer Science Press, Second Edition, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. Balagurusamy, "Data Structures", Tata McGraw-Hill Education, 2019.
2. D.Samanta, "Classic Data Structures, Prentice-Hall of India, Second Edition, 2012.
3. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c", Prentice-Hall of India, Second Edition, 2007.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition, 2006.

U20EST359	PROGRAMMING IN C++	L	T	P	C	Hrs
		3	0	0	3	45

(Common to IT,CSE,CCE)

Course Objectives

- To introduce the concepts of Basic Object Oriented concepts and Programming Basics.
- To understand in depth about the Classes and Objects.
- To study the Operator overloading and Inheritance concepts.
- To acquaint the Files and Exception Handling concepts.
- Explain Templates and STL.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Describe the programming elements of C++. **(K1)**
CO2 - Explain the concepts Object oriented approach for finding Solutions **(K2)**
CO3 - Solve various real-world problems using inheritance concept **(K3)**
CO4 - Manipulate programs using concepts of files and streams in C++. **(K3)**
CO5 - Exemplify simple applications using templates. **(K3)**

UNIT I INTRODUCTION TO C++ **(9 Hrs)**

Basic components of a C++ – Program and program structure – Compiling and Executing C++ Program – Data types – Expression and control statements Iteration statements in C++ – Introduction to Arrays – Multidimensional Arrays – Strings and String related Library Functions – Functions – Passing Data to Functions – Scope and Visibility of variables in Functions.

UNIT II PRINCIPLES OF OBJECT ORIENTED PROGRAMMING AND CONSTRUCTORS **(9 Hrs)**

Basic Concepts of Object-Oriented Programming: Benefits of OOP – Object Oriented Languages – Applications of OOP. Classes and Objects: Data members – Member functions – THIS Pointer – Friends – Friend Functions – Friend Classes – Friend Scope – and Static Functions – Constructors and Destructors –Static variables and Functions in class – Operator Overloading in C++ – Overloading Unary Operators – Overloading binary operators.

UNIT III INHERITANCE **(9 Hrs)**

Inheritance in C++ – Types of Inheritance – Pointers – Objects and Pointers – Multiple Inheritance. Virtual Functions – Polymorphism – Abstract classes. Real time examples in OOPS.

UNIT IV FILES AND STREAMS **(9 Hrs)**

Exception Handling: Exception – Basics – Exception Handling Mechanism – Throwing Mechanism – Catching Mechanism – Rethrowing Exception. Standard input and output operations: C++ iostream hierarchy – Standard Input/output Stream Library – Organization Elements of the iostream Library – Programming using Streams – Basic Stream Concepts. File input and output: Reading a File – Managing I/O Streams – Opening a File – Different Methods – Checking for Failure with File Commands – Checking the I/O Status Flags – Dealing with Binary Files – Useful Functions.

UNIT V TEMPLATES AND STL **(9 Hrs)**

Class templates: Implementing a class template - Implementing class template member functions – Using a class template – Function templates – Implementing function templates – Using template functions – Template instantiation – Class template specialization – Template class partial specialization – Template function specialization – Template parameters – Static members and variables – Templates and friends – Templates and multiple – File projects. Standard Template library: Containers – Iterators and application of container classes.

Text Books

1. Yashavant Kanetkar , " Let Us C++ ",BPB Publications, 2020.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill, 7th Edition, 2018.
3. Herbert Schildt, "C++ - The Complete Reference", McGraw Hill Education, 4th edition, 2017.

U20ITT305	COMPUTER NETWORKS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the protocol layering and physical level communication.
- To analyze the basic functionality of data link layer
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.
- To understand the concepts of application layer protocols.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Discuss the knowledge on principles of computer networks and physical layer signal transmission along with impairments and performance analysis **(K2)**
CO2 - Explain the concepts and functionality of data link layer **(K2)**
CO3 - Exemplify the functions and different routing algorithms of network layer. **(K3)**
CO4 - Illustrate the various functionalities of the protocols in transport layer **(K2)**
CO5 - Outline the working of various application layer protocols. **(K3)**

UNIT I INTRODUCTION **(9 Hrs)**

Introduction: Uses of Computer Networks-Network Hardware-Network Software-Reference Models- **Physical Layer:** The Theoretical Basis of Data Communication-Guided Transmission Media-Wireless Transmission-Communication Satellites -MTS

UNIT II DATA LINK LAYER **(9 Hrs)**

Data Link Layer: Design Issues- Framing- Error Detection & Correction-Elementary Data Link Protocols- Sliding Window Protocols-**Mac Sub Layer:** The Channel Allocation problem-Multiple Access Protocols-Ethernet-Wireless LAN's-Bluetooth- Data Link layer switching

UNIT III NETWORK LAYER **(9 Hrs)**

Network Layer Design Issues-Routing Algorithms-Congestion Control Algorithms-Quality of Service-Internetworking-The Network Layer in the Internet

UNIT IV TRANSPORT LAYER **(9 Hrs)**

The Transport Service-Elements of Transport protocols-A Simple Transport Protocol-The Internet Transport Protocol: UDP-The Internet Transport Protocol: TCP

UNIT V APPLICATION LAYER **(9 Hrs)**

The Domain Name System-Electronic Mail-The World Wide Web-Multimedia

Text Books

1. A.S. Tanenbaum, ComputerNetworks, 5thedition, Pearson Education/PHI, New Delhi, India, 2011.
2. Behrouz A .Forouzan, Data communication and Networking, 5thEdition, Mc Graw-Hill, India, 2014.
3. Kurose, Ross, Computer Networking: A top down approach, Pearson Education, India, 2010.

Reference Books

1. Davie Bruce S. and Peterson Larry L., "Computer Networks - A System Approach", 5th Edition, Morgan Kaufmann, 2012, Elsevier Inc.
2. Godbole, Achyut S and Kahate Atul., "Data Communication and Networks", 2nd Edition, Tata McGraw Hill Publishing Company, New Delhi, 2011.

Web References

1. https://www.edx.org/learn/problem-solving
2. https://www.tutorialspoint.com/data_communication_computer_network/
3. https://www.geeksforgeeks.org/last-minute-notes-computer-network/

U20ITT306	DATABASE MANAGEMENT SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the various data models, conceptualize E-R diagram and depict using relational model
- To gain knowledge about database languages and frame query using Relational Algebra and SQL
- To understand and design an efficient database schema using the various normal forms
- To impart knowledge on data storage and transaction processing, concurrency control techniques and recovery procedures
- To explore knowledge on tools and practice case studies

Course Outcomes

After completion of the course, the students will be able to

CO1 - Explain the concepts of Database Management System and develop Entity Relationship model and Relational Models for a given application **(K2)**

CO2 - Manipulate and build database queries using Structured Query Language and relational algebra **(K3)**

CO3 - Use data normalization principles to develop a normalized database for a given application. **(K3)**

CO4 - Analyze and implement transaction processing, concurrency control and database recovery protocols in databases**(K2)**

CO5 - Apply tools like NoSQL, MongoDB, Cassandra on real time applications **(K3)**

UNIT I INTRODUCTION **(9 Hrs)**

Database Systems– Data Models – Database System Architecture - Entity-Relationship Model - ER Diagram- Extended ER Model –ER into Relational Model - Relational Model: Structure of Relational Databases, Database Schema, Keys, Tables

UNIT II DATABASE LANGUAGES **(9 Hrs)**

Relational Algebra – Extended-Relational Algebra Operations –SQL: Introduction – DDL – DML –Integrity Constraints-Set Operations-Joins – Nested Queries -View- Trigger - Stored Procedures

UNIT III RELATIONAL-DATABASE DESIGN AND DATA STORAGE **(9 Hrs)**

Introduction to Schema Refinement – Decomposition – Lossless Decomposition – Functional Dependencies – Normal Forms – 1NF, 2NF, 3NF, BCNF, 4NF. RAID - File Organization - Indexing, Ordered Index, Index files, Hashing - Static and dynamic hashing.

UNIT IV TRANSACTIONS **(9 Hrs)**

Transaction concepts and states– Concurrent Execution-Serializability-Concurrency Control: Lock based Protocol - Timestamp based Protocol - **Recovery System**: – Log-Based Recovery – Shadow Paging

UNIT V CASE STUDY **(9 Hrs)**

NoSQL – Document Database: MongoDB - Multi-dimensional: Cassandra

Text Books

1. Silberschatz, Korth, Sudarshan, Database System Concepts, 7thEdition – McGraw-Hill Higher Education, International Edition, 2019.
2. Ramez Elmasri, and Shamkant B. Navathe, Fundamentals of Database Systems (7th edition), ,Publisher: Pearson,2016.
3. Raghu Ramakrishnan, —Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.

Reference Books

1. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.
2. Date C J, Kannan A and Swamynathan S, "An Introduction to Database Systems", 8th Edition, Pearson Education, New Delhi, 2006.
3. Alan Beaulieu, "Mastering SQL Fundamentals", Second Edition, O'Reilly,2009

U20ITT307	SOFTWARE ENGINEERING AND PROJECT MANAGEMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the software process and process models applied for software engineering
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the design process and styles suitable for different software constraints
- To understand the testing strategies applied to validate and verify the software.
- To understand the project management techniques for successfully controlling the project development.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Identify the suitable process model for software project development. **(K1)**
CO2 - Illustrate the principles for validating the software requirements **(K1)**
CO3 - Apply systematic procedure for software design and deployment. **(K3)**
CO4 - Compare and contrast the various testing and maintenance **(K3)**
CO5 - Manage project schedule, estimate project cost and effort required.. **(K2)**

UNIT I SOFTWARE PROCESS **(9 Hrs)**

Introduction to Software Engineering, Software Process, Software Process Models: Waterfall Model, Incremental model, Evolutionary model, Agile process model: Extreme Programming, Scrum.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION **(9 Hrs)**

Functional and non-functional requirements -The software requirements document -Requirements specification - Requirements engineering processes - Requirements elicitation and analysis -Requirements validation - Requirements management

UNIT III SOFTWARE DESIGN **(9 Hrs)**

Design process – Design Concepts-Design Model: Architectural Design : Software Architecture- Architectural styles, DFD Model, Architectural Mapping using Data Flow- Component level Design: Component - Design Guidelines-Cohesion and Coupling-User Interface Design: Golden Rules- Interface analysis and Design.
Case Study: Use design tools to develop the design models for any real time application.

UNIT IV TESTING **(9 Hrs)**

Software testing fundamentals-Testing Process-Software testing Strategy: Unit Testing – Integration Testing – Validation Testing – System Testing. White box testing- basis path testing and control structure testing-black box testing- Regression Testing - Debugging- Testing Tools.

UNIT V PROJECT MANAGEMENT **(9 Hrs)**

Project Management spectrum- Process and project metrics. Project Planning: Project Estimation – LOC and FP Based Estimation, COCOMO Model, Project Scheduling and Tracking- Work Breakdown Structure, Activity Network, CPM, PERT, Gantt chart and Earned Value Analysis. Team Management - Software Quality Management, Software Configuration Management, Risk Management and Process Improvement Management.

Text Books

1. Roger Pressman, Bruce Maxim, "Software Engineering – A Practitioner's Approach", Nineth Edition, Mc Graw Hill International Edition, 2019.
2. Ian Sommerville, "Software Engineering", Tenth Edition, Pearson Education Asia, 2016.
3. Rajib Mall, "Fundamentals of Software Engineering", Fifth Edition, PHI Learning Private Limited, 2018.

Reference Books

1. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
2. Watts S. Humphrey., "Managing the Software Process", Pearson Education, 2008.

U20HSP301	GENERAL PROFICIENCY–I	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To enrich strong vocabulary and decoding skills through comprehension analysis
- To advance communication and leadership skills pragmatically
- To pronounce English sounds in isolation and in connected speech
- To expand effective written communication skills to meet organizational goals
- To extend knowledge on verbal aptitude and prepare for interviews

Course Outcomes

After completion of the course, the students will be able to

CO1 - Interpret meaning and apply reading strategies in technical and non-technical context **(K2)**
CO2 - Develop interpersonal communication skills professionally **(K3)**
CO3 - Infer the distinct speech sounds and overcome native language influence **(K2)**
CO4 - Demonstrate various forms of formal writing **(K2)**
CO5 - Apply the techniques of verbal aptitude in competitive exams **(K3)**

UNIT I - COMPREHENSION ANALYSIS (6 Hrs)

Listening: Listening Comprehension (IELTS based) – **Speaking**: Break the iceberg - **Reading:** Reading technical passage (IELTS based) - **Writing:** Writing Task: 1 (IELTS: Graph/ Process /Chart Description) **Vocabulary:** Synonyms (IELTS)

UNIT II - PERSONALITY DEVELOPMENT (6 Hrs)

Listening: Interview Videos- **Speaking:** Extempore& Presentation (Soft Skills) - **Reading:** British & American Vocabulary, Read and review (Books, Magazines) - **Writing**: SWOT Analysis **Vocabulary:** Idioms (IELTS)

UNIT III -INFERENTIAL LEARNING (6 Hrs)

Listening: Listening Speech sounds to overcome Mother Tongue Influence, Anecdotes– **Speaking**: Interpersonal Interaction & Situational attribution–**Reading**: Distinguish between facts & opinions - **Writing:** Writing Conversation to different context **Vocabulary:** Phrasal Verbs (IELTS)

UNIT IV - INTERPRETATION AND FUNCTIONAL WRITING (6 Hrs)

Listening: Group Discussion videos - **Speaking:** Group Discussion Practice - **Reading:** Interpretation of data - Graph, table, chart, diagram (IELTS based) -**Writing**: Writing Task: 2 (IELTS) **Vocabulary:** Collocations (IELTS)

UNIT V- APTITUDE (6 Hrs)

Language Enhancement: Articles, Preposition, Tenses
Verbal Ability Enhancement: Blood Relation, Completing Statements- Cloze test, Spotting Errors –Sentence Improvement, One Word Substitution, Word Analogy, Word Groups(**GATE**)

Reference Books

1. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, New Delhi, 2012.
2. Mn,Taylor, and Grant Taylor. "English Conversation Practice". Tata McGraw-Hill Education, 1975.
3. Bailey, Stephen. "Academic writing: A practical guide for students". Psychology Press, 2003.
4. Aggarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
5. Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

Web References

1. https://www.ielts-exam.net/grammar/
2. https://ieltsfocus.com/2017/08/02/collocations-ielts/
3. https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
4. https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
5. https://www.examsbook.com/word-analogy-test-questions-with-answers

		L	T	P	C	Hrs
U20BSP323	**NUMERICAL METHODS LABORATORY** (Common to CSE and IT)	0	0	2	1	30

Course Objectives

- To learn the techniques of non – linear equation using c program.
- To understand the numerical solution of a matrix by power - method using c program.
- To know the techniques of solving simultaneous equations using c program.
- To introduce the numerical techniques of integration using c programming.
- To study about the numerical solution of parabolic equation.

Course Outcomes

After completion of the course, the students will be able to

CO1 – Find out the root of the Algebraic and Transcendental equations using C Programming. **(K3)**
CO2 – Know the concept of matrix by power method using C programming. **(K3)**
CO3 – Solve the system of simultaneous equations using C programming. **(K3)**
CO4 – Implement numerical techniques of integration using C programming. **(K3)**
CO5 – Find the numerical solution of parabolic equation using C programming **(K3)**

List of experiments:

1. Roots of non – linear equation using bisection method.
2. Roots of non – linear equation using Newton's method.
3. Find the largest Eigen value of a matrix by power - method.
4. Solve the system of linear equations using Gauss - Elimination method.
5. Solve the system of linear equations using Gauss - Jordan method.
6. Solve the system of linear equations using Gauss - Seidal iteration method.
7. Find the area by using trapezoidal rule.
8. Find the area by using Simpson's 1/3 rule.
9. Find the area by using Simpson's 3/8 rule.
10. Find the numerical solution of heat equation.

Reference Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information,Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., (Seventh Edition) 2019.
4. K. Sankara Rao, "Numerical Methods for Scientists and Engineers", PHI Learning Pvt.Ltd, New Delhi, 3rd Edition,2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

Web References

1. http://nptel.ac.in/courses/111107063
2. http://nptel.ac.in/courses/122102009
3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	-	-	-	-	-	1	3	-	1
2	2	1	-	-	-	1	-	-	-	-	-	1	3	-	1
3	3	2	1	1	-	1	-	-	-	-	-	1	3	-	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	-	1
5	3	2	1	1	-	-	-	-	-	-	-	1	3	-	1

Correlation Level: 1-Low, 2-Medium, 3- High

U20ESP357	DATA STRUCTURES LABORATORY (Common to ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS, CCE)	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the basic concepts of Data Structures.
- To learn about the concepts of Searching Techniques.
- To explore about the concepts of Sorting Techniques.
- To know about the linear Data Structures.
- To study about non-linear Data Structures.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Analyze the algorithm's / program's efficiency in terms of time and space complexity. **(K3)**
CO2 - Solve the given problem by identifying the appropriate Data Structure. **(K3)**
CO3 - Solve the problems of searching and sorting techniques. **(K3)**
CO4 - Solve problems in linear Data Structures. **(K4)**
CO5 - Solve problems in non-linear Data Structures. **(K4)**

List of Exercises

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list. a)Delete an element from list c) Search for a key element in list d) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement dequeue (double ended queue) ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.
8. Write a C program that use recursive functions to traverse the given binary tree in a) Preorder b) Inorder and c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd Edition, 2019.
2. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st Edition, 2013.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st Edition, 2017.
4. Reema Thareja, "Data structures using C", Oxford University, 2nd Edition, 2014.
5. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st Edition, 2019.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. https://www.w3schools.in/data-structures-tutorial/intro/
3. https://nptel.ac.in/courses/106103069/
4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. https://nptel.ac.in/courses/106103069/

U20ESP360	PROGRAMMING IN C++ LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

(Common to IT,CSE,CCE)

Course Objectives

- To introduce the concepts of Basic Object Oriented concepts and Programming Basics.
- To gain insight into the Functions and Array usages using C++.
- To understand in depth about the Classes and Objects.
- To study the Operator overloading and Inheritance concepts.
- To acquaint the Files and Exception Handling concepts.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Implement the Object Oriented concepts in simple applications. **(K3)**
CO2 - Employ the Functions and Arrays in simple programs. **(K3)**
CO3 - Demonstrate simple programs with Classes and Objects. **(K3)**
CO4 - Illustrate Operator overloading and Inheritance concepts. **(K3)**
CO5 - Experiment Files and Exception Handling concepts. **(K3)**

List of Exercises

1. Control Structures and Looping Structures.
2. Array Usages.
3. Class Declarations, Definition, and Accessing Class Members.
4. Constructor, parameterized constructor and copy constructors.
5. Friend Function and Friend Class.
6. Function Overloading and Constructor Overloading.
7. Operator Overloading.
8. Access Members of a Class Using Pointer to Object Members.
9. Single Inheritance and Multiple Inheritances.
10. Multilevel inheritance, Hierarchical Inheritance and Hybrid Inheritance.
11. Virtual Classes and Abstract Classes.
12. Exception Handling.
13. IOStream, IStream, Ostream classes and their usages.
14. FileStream Operations.
15. Template Based Program to Sort the Given List of Elements.
16. Real World Examples

Reference Books

1. Yashavant Kanetkar, "Let Us C++ ", BPB Publications, 2020.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill, 7th Edition, 2018.
3. Herbert Schildt, "C++ - The Complete Reference", McGraw Hill Education, 4th Edition, 2017.
4. Stanley B. Lippman, Stanley Lippman, Barbara Moo, "C++ Primer", Addison-Wesley Professional, 5th edition 2012.
5. Herbert Schildt, "C++ - From the Ground Up", McGraw Hill Education, 2nd edition, 2010.

Web References

1. http://www.cplusplus.com/doc/tutorial/
2. https://www.tutorialspoint.com/cplusplus/index.htm
3. https://www.w3schools.com/cpp/
4. https://www.javatpoint.com/cpp-tutorial
5. https://www.geeksforgeeks.org/cpp-tutorial/

U20ITP303	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand data definitions and data manipulation commands
- To understand data selection and data projection commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of databases
- To understand design and implementation of typical database applications.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Implement relational database systems using SQL statements. **(K3)**
CO2 - Use typical data definitions and manipulation commands in various applications. **(K3)**
CO3 - Demonstrate applications using Nested and Join Queries. **(K3)**
CO4 - Execute various advance SQL queries related to Transaction Processing. **(K3)**
CO5 - Build commercial relational database systems using trigger and cursor concept. **(K3)**

List of Experiments

Structured Query Language:

1. Data Definition Language
2. Data Manipulation Language
3. Data Selection and Projection statements
4. Aggregate Functions
5. Joins
6. Built in Functions
7. Nested Queries
8. Set Operations
9. View
10. Transaction Control Language
11. Data Control Language

PL/SQL:

12. Simple PI/SQL Programs
13. Trigger
14. Cursor : Implicit Cursor and Explicit Cursor

Reference Books

1. Oracle developer handbook
2. SQL/PL/SQL for Oracle by P.S. Deshpande IIT Madras,Dream tech Press
3. Alan Beaulieu, Mastering SQL Fundamentals, Second Edition, O"Reilly,2009
4. Silberschatz, Korth, Sudarshan, Database System Concepts, 7thEdition – McGraw-Hill Higher Education, International Edition, 2019

Web References

1. www.oracle-developer.net
2. www.oracle.com/DBA

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
2	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
4	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2
5	3	2	1	1	3	-	-	-	-	-	-	-	3	3	2

Correlation Level: 1-Low, 2-Medium, 3- High