

Semester IV

SY B. Tech. Information Technology

(KJSCE SVU 2020)

Course Code	Course Title						
116U04C401	Probability, Statistics and Optimization Techniques						
	TH		P	TUT	Total		
Teaching Scheme(Hrs.)	3		-	1	4		
Credits Assigned	3		-	1	4		
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	30	20	50	25	--	--	125

\$ Course Common with Computer Engineering

Course prerequisites: Basics of Statistics and Probability, Introductory Linear programming problems

Course Objectives:

This course Exposes students to the concepts of Correlation, Regression for given bivariate data. Students are made familiar with different discrete and continuous probability distributions. The course acquaints students with concepts of Large sample test, Small sample test and Chi – Square test. The course familiarizes students with different methods of solving Linear and Non Linear Programming problems. Some basic queuing theory models are also discussed in the course. Using these methods it will be possible to analyze and interpret a given real life situation and think of possible solutions.

Course Outcomes

At the end of successful completion of the course the student will be able to

- CO1. Apply concepts of Binomial, Poisson, Exponential and Normal distribution to solve Engineering problems.
- CO2. Apply concepts of correlation, regression for given bivariate data.
- CO3. Apply Large sample test and small sample test to analyze collected data.
- CO4. Apply concepts of Linear and Nonlinear programming methods to solve problems.
- CO5. Apply the methods of single server limited queue and single server unlimited queue models to analyze and interpret the data.

Module No.	Unit No.	Details	Hrs.	CO
1	Probability and Probability Distribution		12	CO1
	1.1	Conditional Probability, Bayes' theorem, Joint Probability		
	1.2	Discrete and Continuous Probability Distribution		
	1.3	Binomial Distribution, Poisson Distribution		
	1.4	Uniform Distribution, Normal Distribution, Exponential Distribution		
2	Correlation and Regression		06	CO2
	2.1	Correlation, Co-variance, Karl Pearson Coefficient of Correlation & Spearman's Rank Correlation Coefficient.		
	2.2	Regression Coefficients, lines of regression & logistic regression.		
3	Sampling Theory		07	CO3
	3.1	Sampling distribution. Test of Hypothesis. Level of significance, critical region. One tailed and two tailed tests. Interval Estimation of population parameters. Large and small samples.		
	3.2	Difference between sample mean and population means for large samples, Test for significance of the difference between the means of two large samples.		
	3.3	Student's t-distribution: Test for significance of the difference between sample mean and population means, Test for significance of the difference between the means of two Samples, paired t-test.		
	3.4	Chi-square distribution as a Test of Independence, Test of the Goodness of fit and Yate's correction.		
	3.5	Fisher's z-test		
4	Optimization Techniques		13	CO4
	4.1	Types of solution, Standard and Canonical form of LPP, Basic and feasible solutions, simplex method.		
	4.2	Artificial variables, Big -M method (method of penalty).		
	4.3	Duality and Dual Simplex method		
	4.4	Unconstrained optimization, problems of two or three variables with one equality constraint using Lagrange's Multiplier method.		
	4.5	Problems of two or three variables with one inequality constraint using Kuhn-Tucker conditions		
5	Queuing Theory		07	CO5
	5.1	Introduction, Features of Queuing , solution of Queuing Models.M/M/1(Single Server ,Unlimited Queue Model)		
	5.2	M/M/1 Single Server ,limited Queue Model		
Total			45	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1	B. S. Grewal	<i>Higher Engineering Mathematics</i>	Khanna Publications, India	43 rd Edition 2014
2	Erwin Kreyszig	<i>Advanced Engineering Mathematics</i>	Wiley Eastern Limited, India	10 th Edition 2015
3	J. K. Sharma	<i>Operation research: Theory and Applications</i>	Laxmi Publications, India	6 th Edition 2017
4	S.C.Gupta and V.K.Kapoor	<i>Fundamentals of Mathematical Statistics</i>	Sultan Chand & Sons	11 th Edition 2009
5	Ronald E.Walipole, Raymond H.Myers	<i>Probabilities & Statistics for Engineers & Scientists</i>	Pearson Education	9 th Edition 2010
6	P. N. Wartikar and J. N. Wartikar	<i>A text book of Applied Mathematics Vol I & II</i>	Pune VidyarthiGruha, India	6 th Edition 2012

Term-Work will consist of Tutorials covering entire syllabus of “Probability, Statistics and Optimization Techniques”(116U04C401). Students will be graded based on continuous assessment of their term work. At least 2 tutorials will be conducted with the help of Mathematical and Statistical software in the Laboratory.

Course Code	Course Title						
116U04C402	Information Theory and Coding						
	TH		P	TUT	Total		
Teaching Scheme(Hrs.)	3		-	1	4		
Credits Assigned	3		-	1	4		
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	30	20	50	25	--	--	125

Course prerequisites: Basic concepts of Discrete Mathematics, Data Communication and Networking

Course Objectives:

The objective of the course is to impart knowledge of foundation of Information theory – the theory that provides quantitative measures of information and allows us to analyze and characterize the fundamental limits of communication systems. It includes detailed knowledge of compression techniques and error control methods . The Course also covers concept of basic number theory which forms the foundation for the cryptography

Course Outcomes

At the end of successful completion of the course the student will be able to

- CO 1. Understand basics of Information Theory, Information Source and Channel.
- CO 2. Illustrate different Data Compression algorithms.
- CO 3. Demonstrate the concepts and techniques for error detection and correction.
- CO 4. Apply basic number theory concepts for securing information.

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K. J. Somaiya College of Engineering, Mumbai -77
(A Constituent College of Somaiya Vidyavihar University)

Module No.	Unit No.	Details	Hrs.	CO
1	Basics of Information Theory		6	CO1
	1.1	Introduction, Measure of Information, Entropy, Information Rate.		
	1.2	Joint and Conditional Entropies, Mutual Information for two discrete random variables.		
	1.3	Channel models, Channel Capacity, Shannon's Theorem		
2	Source Codes		10	CO2
	2.1	Introduction, Coding Parameters, Source coding Theorem		
	2.2	Classification of Codes, Shannon-Fano coding, Huffman coding, Arithmetic coding		
	2.3	LZW coding, Run Length Encoding, Image Compression		
3	Error Control Code :Linear block code		10	CO3
	3.1	Introduction, Types of codes, Types of Errors, Error Control Strategies, Modular Arithmetic ,Use of Galois field and Primitive root for generator polynomial		
	3.2	Linear block codes-Introduction, Generator matrices, Parity check matrices.		
	3.3	Error syndrome, Error detection, Error detecting and error correcting capability.		
	3.4	Standard Array and Syndrome, Decoding, Hamming Code.		
4	Error Control Code: Cyclic code and Convolution code		09	CO3
	4.1	Cyclic codes- Introduction, Generation, Syndrome computation and error detection, Decoding.		
	4.2	Hamming code- Error syndrome, Error Detection and correction, Decoding, Extended Hamming Code, Golay code, Error detection using Cyclic Redundancy check		
	4.3	Convolution codes- Introduction, Tree and Trellis Codes		
	4.4	Encoding, Decoding, Applications		
5	Basics of Number Theory and Cryptography		10	CO4
	5.1	Prime Number Generation, Random Number Generation. Congruences, Solving Linear Congruences $ax+by=d$.		
	5.2	Chinese Remainder Theorem, Fermat's Little and Euler Theorem, Quadratic Residue, Legendre and Jacobi Symbols		
	5.3	Shannon's characteristics of good cipher, confusion and diffusion, concepts of encryption, decryption.		
	5.4	Historical background, Transposition: row key and column key, Substitution: Ceaser cipher (additive), Affine cipher (additive and multiplicative), Polyalphabetic and Monoalphabetic Ciphers: Vignere cipher.		
Total			45	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	ArijitSaha,Nilotpall Manna,Surajit Mandal	<i>Information Theory Coding and Cryptography</i>	Pearson Education, India	First Edition 2013
2.	Ranjan Bose	<i>Information Theory Coding and Cryptography</i>	TMH, India	Third Edition 2016
3.	Khalid Sayood	<i>Introduction to Data Compression</i>	Elsevier	Fourth Edition, 2013
4.	Trappe and Washington	<i>Introduction to Cryptography with Coding theory</i>	Pearson Education, India	Second Edition 2006
5.	S Gravano	<i>Introduction to Error Control Codes</i>	Oxford University Press	First Edition 2007
6.	William Stallings	<i>Data and Computer Communications</i>	Pearson Education, India	Eighth Edition, 2007

- **Term-Work** will consist of tutorial covering entire syllabus of “Information Theory Coding” (116U04C402). Students will be graded based on continuous assessment of their term work.

Course Code	Course Title						
116U04C403	Analysis of Algorithms						
	TH		P	TUT	Total		
Teaching Scheme(Hrs.)	3		-	-	3		
Credits Assigned	3		-	-	3		
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	30	20	50	-	--	--	100

Course prerequisites: Data Structures and Programming concepts

Course Objectives:

The objective of the course is to introduce the fundamentals of analysis of algorithms. The Specifications and process for algorithm analysis is covered using sample algorithms. The course helps understanding efficiency of algorithms and comparison of algorithms based on Efficiency. The course also covers different algorithm design strategies, along with examples.

Course Outcomes

At the end of successful completion of the course the student will be able to

- CO 1. Analyze time and space complexity of basic algorithms
- CO 2. Implement Greedy and Dynamic Programming algorithms
- CO 3. Implement Backtracking and Branch-and-bound algorithms
- CO4. Understand NP-Completeness concept

Module No.	Unit No.	Details	Hrs.	CO
1	Introduction to Algorithms		07	CO1
	1.1	Algorithms as a Technology, Analyzing and Designing Algorithms, Rate of growth of functions, Asymptotic notations and order of growth. Common running times: Linear, quadratic, logarithmic etc. and its examples.		
	1.2	Recurrence relations and methods to solve them: Recursion tree, Substitution and Master Method. Probabilistic Analysis, The Hiring Problem, Indicator Random Variables, Randomized Algorithms		
2	Analysis of Basic Algorithms		12	CO1
	2.1	Insertion sort, Selection sort, Heap sort, Sorting in Linear Time, Lower bounds for sorting, Counting Sort, Radix Sort		
	2.2	Medians and Order Statistics: Minimum and Maximum, Selection in expected Linear time, Selection in worst-case Linear Time.		
	2.3	Divide and Conquer: Quick sort, randomized Quick sort, Merge sort, Strassen's Matrix Multiplication Algorithm		
3	Greedy Algorithms and Dynamic Programming		12	CO2
	3.1	The Greedy Approach, Kruskal's algorithm for Minimum Spanning Tree, Dijkstra's algorithm Single Source Shortest Path, Job Sequencing: With and Without Deadlines, Knapsack Problem : 0/1 Knapsack		
		#Self-learning topic: Prim's Algorithm for Minimum Spanning Trees, Huffman Algorithm		
	3.2	Dynamic Programming and Optimization problems, Optimal Binary Search Trees, Floyd-Warshall Algorithm for All Pair Shortest Path, Longest Common Subsequence, Travelling Salesman Problem		
		#Self-learning topic: Travelling Salesman Problem using Greedy Approach and Dynamic Programming		
4	Backtracking and Branch and Bound Algorithms		08	CO3
	4.1	The Backtracking Technique, N-Queens Problem, Hamiltonian Circuit Problems, Sum of Subsets Problem,		
	4.2	Travelling Salesman Problem, 15 Puzzle Problem and 0/1 Knapsack using Branch and Bound		

5	Computability Theory		06	CO4
	5.1	NP and NP complete		
	5.2	NP reducibility		
Total			45	

Self-learning topics will be evaluated through IA and/or Lab.

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1	T.H. Coreman , C.E. Leiserson,R.L. Rivest, and C. Stein	<i>Introduction to algorithms</i>	Prentice Hall India Publication	3rd Edition 2009
2	Richard E. Neapolitan	<i>Foundation of Algorithms</i>	Jones & Bartlett Students Edition	5th Edition 2016
3	Harsh Bhasin	<i>Algorithms : Design & Analysis</i>	Oxford Higher education, India	1st Edition 2013
4	Jon Kleinberg, Eva Tardos	<i>Algorithm Design</i>	Pearson India Education Services Pvt. Ltd.	10th Edition 2013
5	Jeffrey J. McConnell	<i>Analysis of Algorithms : An Active Learning Approach</i>	Jones and Bartlett Student Edition	2nd Edition 2017

- Instructor needs to provide additional resources to students for in-depth understanding and practical applicability of the indicated topic/topics.

Course Code	Course Title						
116U04C404	Advanced Databases						
	TH		P	TUT	Total		
Teaching Scheme(Hrs.)	3		-	-	3		
Credits Assigned	3		-	-	3		
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	30	20	50	-	--	--	100

Course prerequisites: Knowledge of Database Management systems

Course Objectives:

The course will impart the skills that can help design and develop advanced database models. Students will be able to select appropriate advanced database model depending on the application requirement. This course will also make them aware of challenges and limitations while implementing the models. Further, the student will learn that how enterprise can organize and analyze large amounts of data by creating a data warehouse.

Course Outcomes

At the end of successful completion of the course the student will be able to

- CO 1. Design advanced database systems using Parallel, Distributed and In-memory databases and its implementation.
- CO 2. Design advanced database systems using Object relational, Spatial and NOSQL databases and its implementation.
- CO 3. Understanding of data warehouse and its multi-dimensional modeling.
- CO 4. Apply ETL processing and Online Analytical Processing on the warehouse data.

Module No.	Unit No.	Details	Hrs.	CO
1	● Parallel and Distributed Databases		10	CO 1
	1.1	Parallel Database Concepts, Parallel Query Evaluation		
	1.2	Parallelizing Individual Operations-Sorting, Join		
	1.3	Distributed Database - Concepts, Types , Architecture		
	1.4	Distributed Database Design - Data Fragmentation, Replication, and Allocation Techniques		
	1.5	Query Processing and Optimization in Distributed Databases.		
	1.6	Concurrency Control and Recovery in Distributed Databases		
	1.7	In-memory Databases : Architecture, in- memory database vs disk residence database, practical applications of in-memory databases, challenges of in-memory database.		
2	● Object Based, Spatial Databases and NOSQL Databases		10	CO 2
	2.1	Features Of Object based DBMS		
	2.2	Database Design concepts for an ORDBMS		
	2.3	Nested Relations and Collections		
	2.4	Spatial Database Components, Spatial Objects		
	2.5	Spatial Dimensions, Spatial Relations, Spatial SQL Queries		
	2.6	NOSQL databases: What is NOSQL? , NOSQL business drivers		
	2.7	NOSQL data architectural patterns: Document type, Key-Value, Graph and Column family		
3	● Introduction to Data Warehousing and multi-dimensional Modeling		10	CO 3
	3.1	Operational Vs Decisional Support System ,The Need for Data Warehousing		
	3.2	Data Warehouse Definition, Features , The Information Flow Mechanism, Architecture , Role of Metadata, Classification of Metadata		
	3.3	Data Warehouse Vs Data Marts, Data Warehousing Design Strategies, Data Warehouse Modeling Vs Operational Database Modeling		
	3.4	The Star Schema - Fact Tables and Dimension Tables, The Fact less Fact Table, Keys in the Data Warehouse Schema- Primary		

		Keys, Surrogate Keys & Foreign Keys, The Snowflake Schema, Fact Constellation Schema(Family of Stars)		
	3.5	Updates To Dimension Tables - Slowly Changing Dimensions, Type 1, Type 2 and Type 3 Changes, Large Dimensions , Rapidly Changing Dimensions, Junk Dimensions, Aggregate Fact Tables		
	3.6	Data lake, Architecture of Data lake, Data Warehouse Vs Data lake		
4	● ETL Process		09	CO4
	4.1	Introduction to ETL Process		
	4.2	Data Extraction - Identification of Data Sources, Types - Immediate Data Extraction and Deferred Data Extraction		
	4.3	Data Transformation: Tasks Involved in Data Transformation		
	4.4	Data Loading: Techniques, Loading the Fact Tables and Dimension Tables		
	4.5	Data Quality, Issues in Data Cleansing		
5	Online analytical processing (OLAP)		06	CO4
	5.1	Need for Online Analytical Processing; OLTP Vs OLAP, OLAP and Multidimensional Analysis		
	5.2	● OLAP Operations in Multidimensional Data Model - Rollup, Drill-down, Dice, Slice and Pivot		
	5.3	OLAP Models: MOLAP, ROLAP, HOLAP		
Total			45	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Elmasri and Navathe	<i>Fundamentals of Database Systems</i>	Pearson Education	7th Edition 2015
2.	Korth, Slberchatz,Sudarshan	<i>Database System Concepts</i>	McGraw – Hill	6 th Edition 2010
3.	Raghu Ramakrishnan and Johannes Gehrke	<i>Database Management Systems</i>	McGraw Hill	3 rd Edition 2002
4.	Paulraj Ponniah,	<i>Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals</i>	Wiley India	2 nd Edition 2009
5.	McCreary, D., and Kelly	<i>Making sense of NoSQL</i>	Manning Press	2014

- Instructor needs to provide additional resources to students for in-depth understanding and practical applicability of the indicated topic/topics.

Course Code	Course Title						
116U04L401	Competitive Programming Laboratory						
	TH		P	TUT	Total		
Teaching Scheme(Hrs.)	-		2	2	4		
Credits Assigned	-		1	2	3		
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	-	-	-	50	-	50	100

Course prerequisites: Knowledge about any of the programming language, Data Structures

Course Objectives:

The major objective of the course is to develop the programmer with the comprehensive capabilities required for the efficient software development. It covers best practices required for the quick and optimized development of the most frequently used operations and algorithms belonging to different application domains.

Course Outcomes

At the end of successful completion of the course the student will be able to

- CO1. Inculcate the best practices that are essential for competitive programming
- CO2. Understand the fundamental concepts for managing the data using different data structures such as lists, queues, trees etc.
- CO3 . Understand the Graphs, related algorithms, efficient implementation of those algorithms and applications
- CO4. Learn effective computation and programming practices for numeric and string operations and computation geometry

Module No.	Unit No.	Details	Hrs.	CO
1	● Best practices for Competitive programming		05	CO1
	1.1	Mastering the programming language, efficient testing and debugging		
	1.2	Quick identifying problem type, Algorithm analysis, time complexity, calculation rules, common time complexities, estimated efficiency, examples		
2	● Optimization of Data Structures and Algorithms		08	CO2
	2.1	Optimized implementation of Arrays, Dynamic arrays, single, doubly linked list		
	2.2	Optimized implementation of Stack, queue, priority queue, tree, Tree traversal, Optimized binary search tree (OBST), Heap, Hash tables, Set and Map structures, Trie structure Segment Trees using Lazy Propagation, Fenwick Trees or Binary Indexed Trees, Applications of Fenwick and Segment Trees, Heavy light Decomposition, Sparse table algorithm		
	2.3	Basic concepts of Greedy programming, coin problems , scheduling, data compression, knapsack problem		
	2.4	Basic concepts of dynamic programming, coin problems, longest increasing subsequence, knapsack problem		
3	● Strings, Arithmetic and Algebra operations		08	CO3
	3.1	Introduction to Strings, Arithmetic and Algebra operations and its applications Character codes, representing strings		
	3.2	Searching, Pattern searching, String manipulation, string merging , pruning search, generating subsets, generating permutations		
	3.3	Number theory, primes and factors, modular arithmetic, Program arithmetic operations on rationals, Algebra: square root algorithms – combining algorithms, Logarithm, Basic counting techniques, Other Counting Sequences		
	3.4	Recurrence Relations, Binomial Coefficients, Recursion and Induction Problems		
4	Graphs		05	CO3
	4.1	Introduction to Graph theory and applications, Data structure for graphs, Traversal: Breadth first and Depth first		
	4.2	Dijkstra's Shortest path algorithm, Kruskals algorithm for spanning trees, topological sorting, Cycle detection, all longest paths		
5	Computational Geometry		04	CO4
	5.1	Introduction to Computational Geometry and its applications, Line segment and intersections, Polygon and angle computation		
	5.2	Algorithms on Grids		
Total			30	

- **Term-Work will consist of Tutorials and laboratory work covering entire syllabus and a Mini Project developed incorporating all the technical skills learned in “Competitive Programming Laboratory” (116U04L401), Students will be graded based on continuous assessment of their laboratory work; one of the assessment will be of 10 marks which may be conducted using any of the online platforms available to evaluate the best programming practices such as HackerRank, LeetCode, CodeChef etc.**
- **Practical and oral Examination will be based on laboratory work and entire syllabus of “Competitive Programming Laboratory” (116U04L401).**

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Antti Laaksonen	<i>Guide to Competitive Programming</i>	Springer	2018
2.	Gayle Laakmann McDowell	<i>Cracking the Coding Interview</i>	CareerCup, LLC	2015
3.	Steven S. Skiena Miguel A. Revilla	<i>Programming challenges The Programming Contest Training Manual</i>	Springer	2006
4.	Antti Laaksonen	<i>Competitive Programmer's Handbook</i>	--	Hand book, 2018
5.	Steven Halim and Felix Halim	<i>Competitive Programming 3: The Lower Bounds of Programming Contests</i>	--	Handbook for ACM ICPC And IOI CONTESTANTS 2013

- Instructor needs to provide additional resources to students for in-depth understanding and practical applicability of the indicated topic/topics.

Course Code	Course Title						
116U04L402	Web Programming I Laboratory						
	TH		P	TUT	Total		
Teaching Scheme(Hrs.)	-		2	2	4		
Credits Assigned	-		1	2	3		
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	-	-	-	50	-	50	100

Course prerequisites: Knowledge of Programming language

Course Objectives:

The objective of this project-driven course is to acquaint with necessary techniques for developing client/server applications. The course will introduce concept of HTML and CSS to create and maintain Web pages, grid layout and responsive web page. Students will be familiarizing with Document Object Model to learn how browser represents web page. In addition, the course will make students conversant with JavaScript, ReactJS, JSON.

Course Outcomes

At the end of successful completion of the course the student will be able to

- CO1: Comprehend basics of web technologies
- CO2: Create Web pages using HTML 5 and CSS
- CO3: Apply JavaScript and JSON for web application development
- CO4: web application using ReactJS

Module No.	Unit No.	Details	Hrs.	CO
1	Introduction to web technologies		02	CO1
	1.1	Introduction to OSI layers, Web system architecture- 1,2,3 and n tier architecture, URL, domain name system, overview of HTTP		
	1.2	Planning a Web Site – Objective and Goals, Audience, Organizing contents, Publishing of Web Site , Function of Web Server ,Introduction to user interface		
		#Self-learning topic: Working of Web Browser, Introduction to Internet Application Protocols – FTP, Telnet, SMTP		
2	● Web Page Creation with HTML 5 and CSS3		09	CO2
	2.1	Formatting and Fonts, Anchors, Backgrounds, images, Hyperlinks, Lists, Tables		
	2.2	HTML5, New Element, Forms, Audio and Video, HTML5 Canvas, SVG in HTML5, Google Map, Geolocation, Web storage, Web Worker, Application cache		
	2.3	Understanding the need for CSS, Basic syntax and structure using CSS, Positioning using CSS, Apply styles to Box Model Class and ID		
	2.4	Create a flexible content layout, Implement a layout using multi-column; implement a layout using position floating, implement a layout using grid alignment		
	2.5	Responsive Web page , Web accessibility		
		#Self-learning topic - HTML <Meta Tag>, Introduction to XHTML		
3	Introduction to XML		02	CO1
	3.1	Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, XSLT, XML Parsing		
		#Self-learning topic - Using XML as Database		
4	Working with JavaScript and JSON		08	CO3
	4.1	Introduction to JavaScript with variables, Types, operators, conditions ,functions		
	4.2	JavaScript Object, Array, Regular Expression, Event Handling		
	4.3	Comprehending advanced Javascript functions-Closures, Callback, Promise and Arrow Functions		
	4.4	The DOM and the Web browser Environment, DOM Manipulation		
	4.5	Data handling with JSON – Data types, Objects, Arrays, JSON Parse, Stringify		
	4.6	Introduction to CBOR, JSON Vs. CBOR		

5	Introduction to ReactJS		09	CO4
	5.1	Evolution of React, Classes, ES6 Modules, Functional programming with Javascript		
	5.2	React page setup, React Elements, React components		
	5.3	React elements as JSX, Babel, Recipes as JSX, React Fragments		
	5.4	Working with webpack		
Total			30	

- Students should prepare all self-learning topics on their own. Self-learning topics will enable students to gain extended knowledge of the topic. Assessment of these topics may be included in term work and Laboratory.
- Term-Work will consist of Tutorials and laboratory work covering entire syllabus. Students will be graded based on continuous assessment of their term work. Practical and Oral examination based on laboratory experiments and entire syllabus

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1	Kogent Learning Solutions Inc.,	<i>HTML 5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery</i>	DreamTech Press, India	2 nd Edition, 2016
2	Robin Nixon	<i>Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5</i>	O'Reilly Media	5 th Edition, 2018
3	Flanagan, David	<i>JavaScript: the definitive guide</i>	O'Reilly Media, Inc	7 th Edition, 2020
4	Kogent Learning Solutions Inc.,	<i>Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, Jsp, XML and Ajax, Black Book</i>	DreamTech Press, India	2013
5	Alex Banks, Eve Porcello	<i>Learning React</i>	O'Reilly Media	2 nd Edition, 2020

- Instructor needs to provide additional resources to students for in-depth understanding and practical applicability of the indicated topic/topics.

Course Code	Course Title						
116U04L403	Analysis of Algorithms Laboratory						
	TH		P	TUT	Total		
Teaching Scheme(Hrs.)	-		2	-	2		
Credits Assigned	-		1	-	1		
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	-	-	-	25	-	25	50

- **Term-Work** will consist of practical covering entire syllabus of “Analysis of Algorithms Laboratory” (116U04C403). Students will be graded based on continuous assessment of their term work.
- **Practical and Oral Examination** will be based on laboratory work and entire theory syllabus of “Analysis of Algorithms Laboratory” (116U04C403).

Course Code	Course Title						
116U04L404	Advanced Databases Laboratory						
	TH		P	TUT		Total	
Teaching Scheme(Hrs.)	-		2	-		2	
Credits Assigned	-		1	-		1	
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	-	-	-	25	-	25	50

- **Term-Work** will consist of practical covering entire syllabus of “Advanced Databases” (116U04C404). Students will be graded based on continuous assessment of their term work.
- **Practical and Oral Examination** will be based on laboratory work and entire theory syllabus of “Advanced Databases” (116U04C404).