Detailed Syllabus
Lecture-wise Breakup

Course Code	**15B11CI212**	**Semester**: Odd	**Semester:** III **Session:** 2021-2022 **Month from** Aug to Dec
Course Name	Theoretical Foundations of Computer Science		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Dr. Dharmveer Singh Rajpoot (JIIT62), Mr. Himanshu Agrawal (JIIT128)
	Teacher(s) (Alphabetically)	Dr. Ankita Verma, Dr. Apeksha, Dr. Dharmveer Singh Rajpoot, Ms. Kirti Aggarwal, Dr. Potukuchi Raghu Vamsi, Dr. Shulabh

COURSE OUTCOMES		**COGNITIVE LEVELS**
C211.1	Apply the concepts of set theory, relations and functions in the context of various fields of computer science e.g. Database, Automata, Compiler etc.	Apply Level (C3)
C211.2	Evaluate Boolean functions and Analyze algebraic structure using the properties of Boolean algebra.	Evaluate Level (C5)
C211.3	Convert formal statements to logical arguments and correlate these arguments to Boolean logic, truth tables, rules of propositional and predicate calculus.	Analyze Level (C4)
C211.4	Apply the fundamental principle of counting, combinatorics and recurrence relations to find the complex pattern and sequences in Given datasets.	Apply Level (C3)
C211.5	Apply graph theory concepts for designing solutions of various computing problems e.g. shortest path, graph colouring, job Sequencing etc.	Apply Level (C3)
C211.6	Explain basic concepts of automata theory and formal languages e.g. Finite automata, regular expressions, context-free grammars etc.	Understand Level (C2)

Module No.	**Title of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Introduction to Discrete Mathematics and Set Theory	Discrete Mathematics: A Brief Introduction, Set Notations, Cardinality of Sets; Some Standard Sets; Venn Diagrams; Operations on Sets; Principle of inclusion and exclusion; Disjoint Sets; Partition; Ordered Set; Cartesian Product of Sets; Algebra of Sets, Bit vector representation of sets.	4
2.	Relations	Domain and Range, Inverse of Relation, Composition of Relations, Different Types of Relations; Partial Order Relation; Hasse Diagram; Lattices; Pictorial or Graphical Representation of Relations; Matrix Representation of Relations; Closure of Relations.	6
3.	Functions and Recursion	Relations vs. functions, Types of functions, composition of functions, Induction, Recursively defined functions, Cardinality, Modeling using Recurrence Relation, Solution of Recurrence Relations, Linear Recurrence Relation with Constant Coefficients.	4
4.	Algebraic Structures	Binary Operations: semi-group, group; Subgroup: Cosets; Ring; Field; Boolean algebra; Binary Arithmetic.	4

5.	Logics	Proposition, Logical Operators, Tautology, Contradiction, Logical Equivalence, Tautological Implication, Converse, Inverse, and Contrapositive, Normal Forms, Arguments validity check, Predicates, Methods of Proof.	5
6.	Counting and Combinatorics	Basic Counting Principle, Permutations and Combinations, Binomial Coefficients, Pigeonhole principle.	3
7.	Graph Theory	Different Types of Graphs, Subgraphs, Operations on Graphs, Walk, Path, and Circuit; Connected Graph, Disconnected Graph, and Components; Euler and Hamiltonian Graphs; Planar Graph; Coloring of Graphs.	5
8.	Automata Theory	Regular Languages: Deterministic finite automata, Non-deterministic finite automata, Regular Expression; Context Free Languages; Turing machine.	11
		Total number of Lectures	**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25(Attendance (10), Assignments/Mini-project (15))
Total	**100**

Project based Learning: All students have to make group of 3-4 students for developing their assignment/mini-project based on the course topics such as Graph Theory, Boolean Algebra, Combinatorics and Recurrence and Finite Automata. It will be evaluated at the end of this semester.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Rosen, K. H., Discrete Mathematics and Its Applications with Combinatorics and Graph Theory, Tata McGraw-Hill, 2017.
2.	Liu, C. L., Elements of Discrete Mathematics, Tata McGraw-Hill, 2018.
3.	Linz, P, An Introduction To Formal Languages And Automata, Narosa Publishing House, 2013.
4.	Sipser, M., Introduction to the Theory of Computation, Second Edition, Thomson Course Technology, 2012.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11CI312	**Semester:** Odd	**Semester:** III **Session:** 2021-2022 **Month from** Aug to Dec
Course Name	Database Systems & Web		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Aditi Sharma, Indu Chawla
	Teacher(s) (Alphabetically)	Ankit Vidyarthi, Mahendra Kumar Gurve, Megha Rathi, Sonal

COURSE OUTCOMES		**COGNITIVE LEVELS**
C212.1	Explain the basic concepts of Database systems and Web components.	Understand Level (Level II)
C212.2	Model the realworld systems using Entity Relationship Diagrams and convert the ER model into a relational logical schema using various mapping algorithms	Apply Level (Level III)
C212.3	Develop a simple web application with client and server side scripting using Javascript and PHP and connect with a given relational database	Create Level (Level VI)
C212.4	Make use of SQL commands and relational algebraic expressions for query processing.	Apply Level (Level III)
C212.5	Simplify databases using normalization process based on identified keys and functional dependencies	Analyse Level (Level IV)
C212.6	Solve the atomicity, consistency, isolation, durability, transaction, and concurrency related issues of databases	Apply Level (Level III)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Databases	Introduction to Databases, Physical Level of Data Storage, Structure of relational databases, Review of SQL Create, Insert, Update, Delete and Select Statements, Overview of NoSQL databases	4
2.	Web Architecture & Introduction	Motivation, characteristics and complexities of web applications, Basics, of Web Server and Application server, differences between web application and conventional software, architecture layers.	2
3.	Client Side Web Technology	SGML, HTML 5, DHTML, CSS, Java script	3
4.	Server Side Web Technology	PHP, Database Connectivity with PHP	4
5.	Database Design and ER Model	Entity type, Attributes, Relation types, Notations, Constraints, Extended ER Features	4
6.	Relational Model	SQL: Data Definition and Data Manipulation, Relational Algebra	9

	and Structured Query Language		
7.	Procedural Language	PL/SQL: Stored Procedures, Functions, Cursors, Triggers	4
8.	Normalisation	Data Dependencies, 2NF, 3NF, BCNF, building normalised databases	5
9.	Transaction Management	Transactions, Concurrency, Recovery, Security	7
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25(Attendance:10, Assignments/Min-Project/Class Test/Quiz/Tutorial):15
Total	**100**

Project Based Learning: Each student in a group of 3-4 will choose a real-life application area. To make a project, the students will analyse and define the need of database systems in terms of functional requirements. Each group will design the Entity Relationship diagram to understand the organisational structure of the application area and implement the database in MySQL. Each group will identify 15-20 typical queries and execute them. For handling the multiple record they will implement cursors ad triggers. Student will design the webpage of the application area and connect with the database.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 7th Edition, McGraw-Hill, 2019
2.	RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson Education, 2016.
3.	Ramakrishnan, Gehrke, Database Management Systems, Mcgraw-Hill, 3rd Edition,Addison-Wesley, 2014.
4.	Thomas Connolly, Carolyn Begg, Database Systems-A Practical Approach to design, Implementation and Management, 6th Edition, Addison-Wesley, 2015.
5.	"PHP and MYSQL Manual" by Simon Stobart and Mike Vassileiou
6.	"PHP and MYSQL Web Development" by Luke Welling and Laura Thomson(Pearson Education), 5th Edition, 2016
7.	"An introduction to database systems" by Bipin C. Desai, West Publishing Company, College & School Division, 2015
8.	Christopher J. Date, Database Design and Relational Theory: Normal Forms and All That Jazz, 2019.
9.	Rajiv Chopra, Database Management System (DBMS): A Practical Approach, 5th Edition, 2016, 682 pages.

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17CI372	**Semester:** Odd	**Semester:** III **Session:** 2021-22 **Month from** Aug to Dec
Course Name	Database System & Web Lab		
Credits	**2**	**Contact Hours**	0-0-1

Faculty (Names)	**Coordinator(s)**	Mahendra Gurve, Payal Khurana Batra, Prathistha Verma
	Teacher(s) (Alphabetically)	Anuradha Gupta, Shariq, Vartika Puri, Aditi Sharma, Indu Chawla, Sonal, Megha Rathi, Prathistha verma, Vikas Hassija

COURSE OUTCOMES		**COGNITIVE LEVELS**
CI271.1	Explain the basic concepts of Database systems and Web components.	Understand level (Level 2)
CI271.2	Develop web page using HTML, CSS with client side scripting using javascript.	Apply level (Level 3)
CI271.3	Develop a simple web application with client and server side scripting using Javascript and PHP and connect to a given relational database.	Apply level (Level 3)
CI271.4	Programming PL/SQL including stored procedures, stored functions, cursors, Triggers.	Apply level (Level 3)
CI271.5	Design and implement a database schema for a given problem-domain and normalize a database.	Create level (Level 6)
CI271.6	Design a Project based on database management	Create level (Level 6)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Introduction to MySQL commands.	1. MySQL Create, Insert, Update, Delete and Select Statements.	CI271.1
2.	Client Side Web Technology	1. Design web page using SGML, HTML 5, DHTML, CSS, Java script.	CI271.2
3.	Server Side Web Technology	1. Develop a web application with client and server side scripting using JavaScript. 2. Develop a web application with client and server side scripting using PHP. 3. Design web application with databased connectivity. 4. Design web application with entering user data into database. **5.** Desig web application for user - database interaction through PHP.	CI271.3, CI271.5
4.	SQL	Simple Queries, Sorting Results (ORDER BY Clause), SQL Aggregate Functions, Grouping Results (GROUP BY Clause), Subqueries, ANY and ALL Multi-Table Queries, EXISTS and NOT EXISTS, Combining Result Tables (UNION, INTERSECT, EXCEPT), Database Updates	CI271.4

5.	Procedural Language	1. Write PL/SQL program for storing data using procedures. 2. Write PL/SQL program for storing data using stored functions. 3. Write PL/SQL program for storing data using cursors and Triggers.	CI271.4
6.	Project	Students are expected to designed web application based on Php or JavaScript and connect with databased to execute insert, update, retrieve and delete data queries.	CI271.5, CI271.6

Evaluation Criteria

Components	**Maximum Marks**
Lab Test-1	20
Lab Test-2	20
Day-to-Day	60 (Project, Lab Assessment, Attendance)
Total	**100**

Project based learning: Each student in a group of 2-3 will have to develop a Project based on different real-world problems. Students have to study the Web and database related Technologies for developing the project. This will enhance the knowledge, development skills and employability of the students in IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 7th Edition, McGraw-Hill,2019
2.	Ramez Elmasri , Shamkant B. Navathe , Fundamentals of Database Systems, 5th Edition, Pearson Education, 2015.
3.	Ramakrishnan, Gehrke, Database Management Systems, Mcgraw-Hill, 3rd Edition, Addison-Wesley,2006.
4.	Thomas Connolly, Carolyn Begg, Database Systems-A Practical Approach to design, Implementation and Management, 6rd Edition, Addison-Wesley,2015.
5.	“PHP and MYSQL Manual” by Simon Stobart and Mike Vassileiou

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11EC211	**Semester:** ODD	**Semester:** III **Session:** 2021 -2022 **Month from** Aug to Dec
Course Name	Electrical Science-2		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Madhu Jain, Megha Agarwal
	Teacher(s) (Alphabetically)	Archana Pandey, Atul Kumar, Atul Srivastava, Bajrang Bansal, Bhagirath Sahu, Garima Kapur, Jyoti Vyas, Kirmender Singh, Mandeep Narula, Satyendra Kumar, Shradha Saxena, Shruti Kalra, Vinay Kumar Tikkiwal, Vivek Dwivedi, Yogesh Kumar

COURSE OUTCOMES		**COGNITIVE LEVELS**
C203.1	Study and analyze the complete response of the first order and second order circuits with energy storage and/or non-storage elements.	Analyze Level (C4)
C203.2	Understand two-port network parameters and study operational amplifier, first-order&second-orderfilters.	Understand Level (C2)
C203.3	Study the properties of different types of semiconductors, PN junction diode, Zener diode and analyze diode applications.	Analyze Level (C4)
C203.4	Study the characteristics, operation of bipolar junction transistor (BJT) and its biasing, stability aspects.	Understand Level (C2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Transient Analysis	First-order network analysis, sequential switching, Differential equation approach for DC and Non constant source, second order network analysis using differential equation approach for DC and non-constant source	10
2.	Two Port Network Parameters	Definition of Z, Y, h and Transmission parameters and their conversions.	5
3.	Introduction to Operational Amplifier and Filters	Introduction to Operational Amplifier and its applications, First-order and Second-order (Low Pass, High Pass, Band pass and Band Stop) RLC Filters.	5
4.	Introduction to Semiconductor	Semiconductor Physics-Energy Band Model, Carrier Statistics, Intrinsic Semiconductors, Extrinsic Semiconductors, Fermi Level, Charge densities in a semiconductor, Carrier Mobility and Drift Current, Hall Effect, Recombination of charges, diffusion and	6

		conductivity equation.	
5.	Diodes &Applications	P-N Junction diode, Biasing the PN Junction diode, Current–Voltage Characteristics of a P-N Junction, Half Wave Rectifier &Full Wave Rectifier, Clipper&Clamping Circuits, Zener Diode and its application as voltage reference , Line and Load Regulations of reference circuits.	8
6.	Bipolar Junction Transistor	Transistor Construction and Basic Transistor Operation, Transistor Characteristics (CE,CB,CC). Transistor Biasing & Stability.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
Total	**100**

Project Based Learning: Students will learn about the transient responses of the first/second order circuits, which is the utmost requirement for electronic circuit design. Also, the students with the knowledge of OP-AMP and filters, can design and analyse the circuits for the signal processing applications.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Text Books:

1.	R. C. Dorfand James A. Svoboda, “Introduction to Electric Circuits”, 9thed, John Wiley & Sons, 2013.
2.	Robert L.Boylestad, Louis Nashelsky, “Electronic Devices and Circuit Theory”, 11thed, Prentice Hall of India, 2014.

Reference Books:

3.	Abhijit Chakrabarti, Circuit Theory Analysis and Synthesis, 7thed, Dhanpat Rai &Co. 2018.
4.	Charles K. Alexander, Matthew N.O. Sadiku, “Fundamentals of Electric Circuits”, 6th Edition, Tata McGraw Hill, 2019.
5.	Jacob Millman, Millman's Electronic Devices and Circuits (SIE), 4thed, McGraw Hill Education, 2015.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11HS211	**Semester:** ODD	**Semester**: III **Session:** 2021-22 **Month from** Aug to Dec
Course Name	Economics		
Credits	3	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	Manas Ranjan Behera (JIIT62), Dr. Anshu Banwari (J128)
	Teacher(s) (Alphabetically)	Dr. Mukta Mani, Dr. Shirin Alavi, Dr. Kanupriya Misra Bakhru, Dr. Akarsh Arora, Dr. Sakshi Varshney

COURSE OUTCOMES		**COGNITIVE LEVELS**
C206.1	*Explain* the basic micro and macro economics concepts.	Understand Level (C2)
C206.2	*Analyze* the theories of demand, supply, elasticity and consumer choice in the market.	Analyze Level (C4)
C206.3	*Analyze* the theories of production, cost, profit and break even analysis	Analyze Level (C4)
C206.4	*Evaluate* the different market structures and their implications for the behavior of the firm.	Evaluate Level (C5)
C206.5	*Examine* the various business forecasting methods.	Analyze Level (C4)
C206.6	*Apply* the basics of national income accounting and business cycles to Indian economy.	Apply Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Economics Definition, Basic economic problems, Resource constraints and welfare maximization. Micro and Macro economics. Production Possibility Curve. Circular flow of economic activities.	2
2.	Basics of Demand, Supply and Equilibrium	Demand side and supply side of the market. Factors affecting demand & supply. Elasticity of demand & supply – price, income and cross-price elasticity. Market equilibrium price.	6
3.	Theory of Consumer Choice	Theory of Utility and consumer's equilibrium. Indifference Curve analysis, Budget Constraints, Consumer Equilibrium.	2
4.	Demand forecasting	Regression Technique Time-series Smoothing Techniques: Exponential, Moving Averages Method	4
5.	Production theory and analysis	Production function. Isoquants, Isocostlines, Optimal combination of inputs. Stages of production, Law of returns, Return to scale.	2
6.	Cost Theory and Analysis	Nature and types of cost. Cost functions- short run and long run Economies and diseconomies of scale	2
7.	Market Structure	Market structure and degree of competition Perfect competition	6

		Monopoly Monopolistic competition Oligopoly	
8	National Income Accounting	Overview of Macroeconomics, Basic concepts of National Income Accounting,	2
9	Macro Economics Issues	Introduction to Business Cycle, Inflation-causes, consequences and remedies: Monetary and Fiscal policy.	2
		Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz+ Project+ Class Participation)
Total	**100**

Project based learning: Students have to form a group (maximum 5 students in each group) and have to do an economic analysis on the topic assigned. An economic impact analysis assesses the impact of an event on the economy in a particular area. It generally measures the effect on revenue, profits, wages and jobs. The knowledge gained in conducting economic analysis will enhance student's decision-making skills.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	H.C. Petersen, W.C. Lewis, *Managerial Economics*, 4th ed., Pearson Education 2001.
2.	D. Salvatore, Managerial Economics in a Global Economy, 8th ed., Oxford University Press, 2015.
3.	S. Damodaran, Managerial Economics, 2 nd ed., Oxford University Press, 2010.
4.	M. Hirschey, Managerial Economics, 12th ed., Cengage India, 2013.
5.	P.A. Samuelson, W.D. Nordhaus, S. Nordhaus,Economics,18th ed., Tata Mc-Graw Hill, 2006.
6.	S.K. Misra & V. K. Puri, Indian Economy, 38th ed., Himalaya Publishing House, 2020.

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17EC271	**Semester:** Odd	**Semester:** III **Session:** 2021 -2022 **Month from:** Sep to Dec
Course Name	Electrical Science Lab-2		
Credits	1	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	Dr. Satyendra Kumar, Mr. Ankur Bhardwaj
	Teacher(s)	Dr. Ashish Gupta, Dr. Ajay Kumar, Dr. Alok Joshi, Dr. Amit Goyal, Dr. Archana Pandey, Mr. Atul Kumar Srivastava, Dr. Bajrang Bansal, Dr. Garima Kapoor, Dr. Hemant Kumar, Dr. Jasmine Saini, Dr. Juhi Gupta, Dr. Kapil Dev Tyagi, Dr. Kaushal Nigam, Dr. Kirmender Singh, Dr. Megha Agarwal, Dr. Parul Arora, Mr. Raghvendra Singh, Dr. Satyendra Kumar, Dr. Saurabh Chaturvedi, Mr. Shivaji Tyagi, Mrs. Shradhha Saxena, Dr. Shruti Kalra, Mrs. Smriti Bhatnagar, Dr. Varun Goel, Mr. Vinay Tikkiwal

COURSE OUTCOMES		**COGNITIVE LEVELS**
C204.1	Study and analyze time response of first order and second order passive circuits	Analyze Level (C4)
C204.2	Understand two port resistive network parameters, operational amplifier applications and first order filter.	Understand Level (C2)
C204.3	Understand the characteristics of pn junction diode and its applications	Understand Level (C2)
C204.4	Understand the characteristics of Common emitter and common base configurations of BJT.	Understand Level (C2)

Module No.	**Title of the Module**	**List of Experiments**	**COs**
1.	First and Second order passive circuits	Study the transient response of a series RC circuit and understand the time constant concept using pulse waveforms.	C204.1
		Study of Time Response of R-L-C Network	C204.1
2.	Two port resistive networks	To determine the Z-parameters of a 2- port resistive network.	C204.2
		To determine the h-parameters of a two-port resistive network.	C204.2
3.	Operational amplifier and its applications	To realize inverting and non inverting configurations using Op-Amp IC 741 amplifier.	C204.2
		To realize an adder and substractor circuits using Op- Amp IC 741 amplifier.	C204.2
4.	PN junction and Zener diodes	To study the forward and reverse bias (volt-ampere) characteristics of a simple p-n junction diode. Also determine the forward resistance of the diode.	C204.3
		To study the forward and reverse bias volt-ampere	C204.3

		characteristics of a zener diode. Also determine the breakdown voltage, static and dynamic resistances.	
5.	Diode applications	To observe the output waveform of half/full wave rectifier and calculate its ripple factor and efficiency.	C204.3
		Realization of desired wave shapes using clipper and clamper circuits.	C204.3
		To study Zener voltage regulator and calculate percentage regulation for line regulation and load regulation.	C204.3
6.	Bipolar Junction Transistor	To plot input characteristics of a common emitter npn BJT.	C204.4
		To plot output characteristics of a common emitter npn BJT.	C204.4
		To plot input characteristic of a BJT in Common Base Configuration.	C204.4
		To plot output characteristic of a BJT in Common Base Configuration.	C204.4
7.	First order filters	To plot frequency and phase response of First order low pass and high pass filter.	C204.2

Evaluation Criteria

Components	**Maximum Marks**
Viva1	20
Viva2	20
Attendance, and D2D	60 (15+45)
Total	**100**

Project Based Learning: Students will learn about the transient response of first and second order passive circuits. Also, student will learn about Op-amp and its applications like adder and substractor circuits. This course also gives the understanding of semiconductor diodes and Bipolar Junction Transistor. These concepts are the required for Electronic circuit design.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	R.C.Dorf, A. Svoboda, "Introduction to Electric Circuits",9th ed, John Wiley & Sons, 2013.
2.	D. Roy Choudhary and Shail B. Jain, " Linear Integrated Circuit," 2nd Edition, NAILP, 2003
3.	A.S .Sedra & K.C.Smith, Microelectronic Circuits Theory and Application, 6th Edition, Oxford University Press, 2015(Text Book)

Detailed Syllabus

Lecture-wise Breakup

Course Code	18B11CS211	**Semester:** Odd	**Semester:** III **Session:** 2021 -2022 **Month from** Aug to Dec
Course Name	Data Structures and Algorithms		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Ankita Wadhwa
	Teacher(s) (Alphabetically)	Ankita Wadhwa

COURSE OUTCOMES		**COGNITIVE LEVELS**
C210.1	Analyze the complexity of different algorithms using asymptotic analysis.	Analyze level [Level 4]
C210.2	Implement various linear and non-linear data structures and their related operations.	Understand level [Level 2]
C210.3	Select and apply relevant data structure for a given problem and evaluate its performance.	Apply level [Level 3]
C210.4	Select and apply appropriate algorithmic design technique (Greedy, backtracking, Divide and Conquer, DP) for solving a given problem and evaluate the solution.	Evaluate level [Level 5]

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to DS and Algorithms	Fundamentals of Data Structures, Memory Allocation, Abstract Data types, Linear and non-linear DS. Introduction to problem solving approach; Growth of functions and solving recurrences; Notations- Big O, Big Omega, Big Theta;	4
2.	Linear Data Structures	Implementation of Arrays: Storage, traversal, Searching (Linear) and Sorting (selection, bubble, insertion). Implementation of Linked List: Singly, Doubly, Circular. Implementation of Stack and Queue.	7
3.	Non-linear DS: Trees and related algorithms	Insertion, deletion and search operations in Binary Tree, BST, AVL. Priority queue using binary heap. Fundamentals of Graphs: Adjacency matrix and list; traversal (DFS/BFS).	9
4.	Algorithm Design Technique: Divide and	Fundamentals of Divide and Conquer (D&C) approach using Binary search, Median Search, Quick sort, and Merge sort and Closest pair, etc.	3

	Conquer		
5.	Algorithm Design Technique: Greedy Algorithms	Fundamentals of greedy based solution approach using Minimum Spanning Trees (Prim's and Kruskal algorithms); Shortest Path using Dijkastra algorithm; Fractional Knapsack; Coinage problem etc.	4
6.	Algorithm Design Technique: Backtracking Algorithms	Fundamentals of backtracking based solution approach using N queen; M-coloring problem; Hamiltonian Cycle detection; Max flow in Network.	5
7.	Algorithm Design Technique: Dynamic Programming	Fundamentals of Dynamic programming based solution approach; 0/1 Knapsack, Coinage problem; Longest common subsequence; Longest increasing sequence; Shortest path using Floyd Warshall; Matrix chain multiplication etc.	6
8.	String Algorithms	Naïve String Matching, Finite Automata Matcher, Rabin Karp matching algorithm, Knuth Morris Pratt. Tries.	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Punctuality in class (5), Assignment (10), Quiz(10))
Total	**100**

Project based leaning: Groups of 2-3 students will choose a project topic. They will use the concepts of DSA to execute their project. In a team, they will learn how to apply the concepts for problem solving in a meaningful way. The knowledge gained will enhance their employability in the IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

	Text Books
1.	Data Structures and Algorithms in C++, Adam Drozdek, Cengage Learning; 4th edition (2012)
2.	Data Structures and Algorithms Made Easy, by NarasimhaKarumanchi, CareerMonk Publications; 5th edition (2016)
3.	An Introduction to Data Structures with Application, by Jean-Paul Tremblay , Paul Sorenson, McGraw Hill Education; 2 edition (2017)
	Reference Books
1	YedidyahLangsam, Moshe J., Augenstein and Aaron M. Tenenbaum: Data Structures Using C and C++, 2nd Edition, PHI, 2001
2.	Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984
3	Dinesh P Mehta, SartajSahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004
4	Sahni: Data Structures, Algorithms and applications in C++, Universities press, Hyderabad, 2005
5	Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002
6	Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson Education Asia, 2003

7	Cormen et al: Introduction to Computer Algorithms, 2nd edition , PHI New Delhi 2003
8	Aho, Hopcraft, Ullman: Data Structures and Algorithms, Pearson Education Asia (Adisson Wesley), New Delhi, 2001
9	Standish: Data Structures in Java, Pearson Education Asia (Adisson Wesley), New Delhi, 2000
10	Knuth: The Art of Computer programming Vol I, Vol III, 2nd edition , Pearson Education Asia (Adisson Wesley), New Delhi, 2002

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15CS211	**Semester:** Odd	**Semester:** III **Session:** 2021-2022 **Month from** Aug to Dec
Course Name	Data Structures and Algorithms Lab		
Credits	2	**Contact Hours**	0-0-4

Faculty (Names)	**Coordinator(s)**	Dr. Vivek Kumar Singh
	Teacher(s) (Alphabetically)	Dr. Vivek Kumar Singh, Mrs. Ankita Wadhwa

COURSE OUTCOMES		**COGNITIVE LEVELS**
C270.1	Demonstrate the use of basic data structure and algorithm design such as Linked lists, Stacks, Queues, and others, for various applications.	Understand Level (C2)
C270.2	Interpret the complexity of algorithms for given problems.	Understand Level (C2)
C270.3	Apply Searching, Sorting, and Trees and use their properties for abstractions and defining modules for implementing functionalities.	Apply Level (C3)
C270.4	Examine case-study specific application of Heaps, Graphs, and Hashing methods.	Apply Level (C3)
C270.5	Model algorithmic solutions for small real-life problems using Backtracking, Greedy algorithm and Dynamic programming, Branch and Bound, and others	Apply Level (C3)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Linear DS: Arrays and related algorithms	Arrays: Storage , traversal, Searching (Linear, Binary, Median, Interpolation), Sorting (Selection, Insertion, Bubble, Merge, Quick), Applications and Manipulations.	C270.1
2.	Analysis of Algorithms	Introduction to problem solving approach; Growth of Functions; determine execution time	C270.2
3.	Linear DS: Stacks & Queues and related algorithms	Stacks and Queues using arrays and linked list, Circular Queue, Priority Queues using Binary Heap, Stack & Queuebased applications.	C270.3
4.	Non-linear DS: Trees and related algorithms	Insertion, deletion and search operations in Binary Tree, BST, AVL, B Tree, B+ Tree . Applications of trees.	C270.4
5.	Non-linear DS: Graphs and related	Graphs storage and basic algorithms,e.g., traversal (DFS/BFS), minimum spanning tree	C270.5

	algorithms	(Prims/Kruskal), Shortest paths in weighted and unweighted graphs. Minimum Spanning Trees (Prim's and Kruskal algorithms); Shortest Path usingDijkastra algorithm; Shortest path using Floyd Warshall;	
6.	Algorithm Design Techniques: Divide and Conquer, Greedy Algorithms, Backtracking Algorithms, Dynamic Programming.	Strassen's matrix multiplication; and Closest pair, etc. Fractional and 0/1 Knapsack;Coinage problem; Job scheduling; Graph coloring; N queen; M-coloring problem; Hamiltonian Cycle detection; Travelling salesman problem; Coinage problem; Longest common subsequence; Longest increasing sequence;	C270.1
7.	Project	Students are expected to design an application based by applying concepts of data structure and algorithms.	C270.1, C270.2, C270.3, C270.4, C270.5

Evaluation Criteria

Components	**MaximumMarks**
LabTest-1	20
LabTest-2	20
Day-to-Day	60 (Project, Lab Evaluations, Attendance)
Total	**100**

Project Based Leaning: Groups of 2-3 students will choose a project topic. They will use the concepts of DSA to execute their project. In a team, they will learn how to apply the concepts for problem solving in a meaningful way. The knowledge gained will enhance their employability in the IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithms, MIT Press, 4th Edition,2022
2	Dale, Nell B., and Chip Weems. Programming and problem solving with C++. Jones & Bartlett Publishers, 2014.
3	Cormen, Thomas H. Algorithms unlocked. Mit Press, 2013.
4	Drozdek, Adam. Data Structures and algorithms in C++. Cengage Learning, 2012.

Extra Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	Fundamental of Data Structures in C++, Horobitz and Sahni and Mehta, 2009, Galgotia
2	Theory and Problems of Data Structures with C++, Shaum's outline, McGraw-hill, 2000
3	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978
4	ACM Transactions on Algorithms (TALG)