Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11CI212	**Semester: ODD**	**Session:** Odd Sem 2019 **Month** from July'19 to Dec'19
Course Name	**Theoretical Foundations of Computer Science**		
Credits	4	**Contact Hours**	**3L +1T**

Faculty (Names)	**Coordinator(s)**	Dr. Dharmveer Singh Rajpoot, Ms. Kirti Agarwal, Pulkit Mehndiratta
	Teacher(s) (Alphabetically)	Anita Sahoo, Ankita Verma, Dharmveer Singh Rajpoot, Kashav Ajmera, Kirti Agarwal, Mahendra Kumar Gurve, Manju, Pawan Kumar Upadhyay, Varsha Garg, Dr Himani, Dr Swati

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 3]
C211.2	Evaluate Boolean functions and Analyze algebraic structure using the properties of Boolean algebra	Evaluate [Level 5]
C211.3	Convert formal statements to logical arguments and correlate these arguments to Boolean logic, truth tables, rules of propositional And predicate calculus	Analyzing [Level 4]
C211.4	Apply the fundamental principle of counting, combinatorics and recurrence relations to find the complex pattern and sequences in Given datasets	Apply [Level 3]
C211.5	Apply graph theory concepts for designing solutions of various computing problems e.g. shortest path, graph coloring, job Sequencing etc.	Apply [Level 3]
C211.6	Explain basic concepts of automata theory and formal languages e.g. Finite automata, regular expressions, context-free grammars etc.	Explain [Level 2]

Module No.	**Subtitle 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;	3

		Partition; Ordered Set; Cartesian Product of Sets; Algebra of Sets, Bit vector representation of sets.	
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.	5
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.	4
8.	Automata Theory	Regular Languages: Deterministic finite automata, Non-deterministic finite automata, Regular Expression; Context Free Languages; Turing machine.	12
Total number of Lectures			**42**
Evaluation Criteria **Components** **Maximum Marks** T1 20 T2 20 End Semester Examination 35 TA 25 **Total** **100**			

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, 2008.
2.	Liu, C. L., Elements of Discrete Mathematics, Tata McGraw-Hill, 2008.
3.	Ullman J. D. Foundations of Computer Science: C Edition, W. H. Freeman; 1994
4.	Tremblay and Manohar , Discrete Mathematical Structures, Tata McGraw Hill
5.	Lipschutz, S. and Lipson, Discrete Mathematics, Tata McGraw-Hill, 2009.
6.	Journal of Discrete Mathematics, Elsevier.
7.	Linz, P, An Introduction To Formal Languages And Automata, Narosa Publishing House, 2007.
8.	Sipser, M., Introduction to the Theory of Computation, Second Edition, Thomson Course Technology, 2007.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11CI312	**Semester : Odd**	**Session :** 2019-2020 **Month from** July'19 to Dec'19
Course Name	Database Systems & Web		
Credits	4	**Contact Hours**	**4(3+1)**

Faculty (Names)	**Coordinator(s)**	Mahendra Kumar Gurve, Kritika Rani
	Teacher(s) (Alphabetically)	Aditi Sharma, Ankit Vidyarthi, Kashav Ajmera, Payal Khurana Batra, Shariq Murtuza ,Sonal, Sudhanshu Kulshrestha, Taj Alam

COURSE OUTCOMES		**COGNITIVE LEVELS**
C271.1 1.	Explain the basic concepts of Database systems and Web components.	Understand Level (Level II)
C271.2 2.	Model the real world systems using Entity Relationship Diagrams and convert the ER model into a relational logical schema using various mapping algorithms	Apply Level (Level III)
C271.3 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)
C271.4 4.	Make use of SQL commands and relational algebraic expressions for query processing.	Apply Level (Level III)
C271.5 5.	Simplify databases using normalization process based on identified keys and functional dependencies	Analyse Level (Level IV)
C271.6 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 and Structured Query Language	SQL: Data Definition and Data Manipulation, Relational Algebra	9
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
Total	**100**

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, 5th Edition, McGraw-Hill,2006
2.	Ramez Elmasri , Shamkant B. Navathe , Fundamentals of Database Systems, 4th Edition, Pearson Education, 2006.
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, 3rd Edition, Addison-Wesley,2002.
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)
7.	"An introduction to database systems" by Bipin C. Desai, West Publishing Company, College & School Division, 1990 - Computers - 820 pages

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11EC211	**Semester(specify Odd/Even)**	**Semester** Odd **Session** 2019-2020 **Month from** July **to** December
Course Name	Electrical Science -2		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Ashish Goel, Satyendra Kumar
	Teacher(s) (Alphabetically)	Atul Kumar Shrivastava, Deeksha Chandola, Garima Kapur, Jyoti Vyas, Kaushal Nigam, Kirmender Singh, Madhu Jain, Mandeep Narula , Nisha Venkatesh, Priyanka Kwatra, Rachna Singh, Ruby Beniwal, Sajai Vir Singh, Shradha Saxena, Shruti Kalra, Vimal Kumar Mishra

COURSE OUTCOMES		**COGNITIVE LEVELS**
C203.1	Study and analyze the first-order and second-order passive circuits.	Analyzing Level (C4)
C203.2	Demonstrate the operational amplifier and logic gates and their applications in analog and digital system design.	Understanding Level (C2)
C203.3	Define the basics of signals, systems and communication.	Remembering Level (C1)
C203.4	Illustrate the electrical machines, transformers and analogous of electrical & mechanical systems.	Understanding 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.	8
2.	Operational Amplifiers	Introduction to Operational Amplifiers, Basic Concepts and their Applications like Comparators, Inverting and Non-inverting Amplifier, Subtractor, Adder, Integrator and Differentiator circuits.	6
3.	Basics of digital electronics	Introduction to Boolean algebra, logic circuits and logic gates, multiplexers and decoders. Introduction to Flip-flops.	10
4.	Introduction of Signals and	Basic overview of Signals and Systems,	4

	Systems	Signal types and their representation- Time Domain, Frequency Domain.	
5.	Introduction of Communications	Basics of digital communication and analogue communication.	3
6.	Machines	Introduction to dc motors and dc generators, three phase and single phase induction motors.	3
7.	Single Phase Transformer	Principle of operation, construction, e.m.f. equation, equivalent circuit, power losses, efficiency (simple numerical problems), introduction to auto transformer.	4
8.	Analogous Electrical and Mechanical Systems	Analogy between mechanical and electrical quantities: Analogous quantities, Analogous equations. Conversion between systems: electrical to mechanical and mechanical to electrical systems.	3
		Total number of Lectures	41

Evaluation Criteria

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

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

1.	Dorf, R.C. and Svoboda, J.A., Introduction to Electric Circuits. John Wiley & Sons.
2.	Mano, M.M., Digital Design. Pearson Education Asia.
3.	Oppenheim, A.V., Willsky, A.S. and Nawab, S.H., Signals and Systems. Prentice-Hall.
4.	A. Anand Kumar, Signals and Systems, PHI Learning Private Limited
5.	A.E. Fitzgerald, C. Kingsley Jr. and At. D. Umans, Electric Machinery, Fifth edition, Mc Graw Hill.
6.	D.C. Kulshreshtha, Basic Electrical Engineering, Mc Graw Hill.
7.	I. J Nagrath and M. Gopal, Control Systems Engineering, New age International, Fifth edition, Fifth edition, 2009.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11HS211	**Semester : ODD** **(specify Odd/Even)**	**Semester** : III **Session 2019-20** Month from: July-December
Course Name	Economics		
Credits	03	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	Dr.Praveen Sharma, Dr.Sakshi Varshney
	Teacher(s) (Alphabetically)	Dr.Amba Agarwal, Dr.Anshu Banwari, Dr.Kanupriya MisraBakhru, Mr.Manas Ranjan Behra, Dr.Mukta Mani, Dr.Praveen Sharma, Dr.Sakshi Varshney, Dr.Shirin Alavi

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

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.	3
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	6
5.	Production theory and analysis	Production function. Isoquants, Isocostlines, Optimal combination of inputs. Stages of production, Law of returns, Return to scale.	3
6.	Cost Theory and Analysis	Nature and types of cost. Cost functions- short run and long run Economies and diseconomies of scale	3

7.	Market Structure	Market structure and degree of competition Perfect competition, Monopoly, Monopolistic competition, Oligopoly	5
8	National Income Accounting	Overview of Macroeconomics, Basic concepts of National Income Accounting,	3
9	Macro Economics Issues	Introduction to Business Cycle, Inflation-causes, consequences and remedies: Monetary and Fiscal policy.	3
		Total number of Lectures	30

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Test +Quiz+ Attendance)
Total	**100**

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., Thomson Asia, 2015.
3.	S. Damodaran, Managerial Economics, 2nd ed., Oxford University Press, 2010.
4.	M. Hirschey, Managerial Economics, 15th ed., Thomson Asia, 2019.
5.	P.A. Samuelson, W.D. Nordhaus, Economics, 19th ed., Tata Mc-Graw Hill, 2010.
6.	S.K. Misra & V. K. Puri, Indian Economy, 37th ed., Himalaya Publishing House, 2019.

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17CI372	**Semester** Odd	**Semester** III **Session** 2019 **Month from** July'19 **to** Dec'19
Course Name	Database System & Web Lab		
Credits	0-0-1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Kashav Ajmera, Sakshi Agarwal
	Teacher(s) (Alphabetically)	Kashav Ajmera, K Rajalakshmi, Mahendra Gurve, Manish Kumar Thakur, Parmeet Kaur, Sangeeta Lal, Sonal, Sakshi Agarwal, Taj Alam

COURSE OUTCOMES		**COGNITIVE LEVELS**
CI271.1	7. Explain the basic concepts of Database systems and Web components.	Understand (Level II)
CI271.2	8. Develop web page using HTML, CSS with client side scripting using javascript.	Apply (Level III)
CI271.3	9. Develop a simple web application with client and server side scripting using Javascript and PHP and connect to a given relational database.	Apply (Level III)
CI271.4	10. Programming PL/SQL including stored procedures, stored functions, cursors, Triggers.	Apply (Level III)
CI271.5	11. Design and implement a database schema for a given problem-domain and normalize a database.	Creating (Level VI)
CI271.6	12. Design a Project based on database management	Create (Level VI)

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.	CI271.3 , CI271.5

		4. Design web application with entering user data into database. 5. Desig web application for user - databse interaction through PHP.	
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 (Project, Lab Assessment, Attendance)	**60**
Total	**100**

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, 5th Edition, McGraw-Hill,2006
2.	Ramez Elmasri , Shamkant B. Navathe , Fundamentals of Database Systems, 4th Edition, Pearson Education, 2006.
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, 3rd Edition, Addison-Wesley,2002.

5.	“PHP and MYSQL Manual” by Simon Stobart and Mike Vassileiou

Detailed Syllabus

Lab-wise Breakup

Course Code	15B17EC271	**Semester -:** Odd (specify Odd/Even)	**Semester-:** Odd, **Session** 2019 -2020 **Month- :** July - December
Course Name	Electrical Science Lab-2		
Credits	2	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	Kaushal Nigam, Mandeep Narula
	Teacher(s)	Amit Goyal, Ankur Bhardwaj, Atul Srivastava, Alok Joshi, Abhishek Kashyap, Bhagirath Sahu, Bajrang Bansal Dhiksha Chandola, Gaurav Verma, Jyoti Vyas, Jasmine Saini, Monika, Madhu Jain, Priyanka Kwatra, Rachna Singh, Ruby Beniwal, Shruti Kalra, Sajai Vir Singh, Satyendra Kumar, Shradha Saxena, Shamim Akhtar, Vishal Saxena, Vijay Khare, Vimal Kumar Mishra, Vinay Anand Tikkiwal, and Vivek Dwivedi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C204.1	Understand Transient analysis and steady state response of series RC circuit.	Understanding Level (C2)
C204.2	Acquire the knowledge of circuits like Adder, Subtractor, Integrator, differentiator; inverting and non inverting amplifier circuits realized using Op-amp IC-741.	Analyzing Level (C4)
C204.3	Study and Implementation of the different logic gates.	Remembering Level (C1)
C204.4	Construct Adder, Subtractor and Multiplexer circuits using logic gates.	Applying Level (C3)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Study of Transient Analysis in the Network Circuit	Transient analysis of a series RC circuit for a given time constant.	C204.1
2.	Study and Analysis of Parallel Resonance Circuits	Analysis of Parallel Resonance circuits	C204.1
3.	Study and Analysis of Series Resonance	Analysis of Series Resonance circuits.	C204.1

	Circuits		
4.	Study and Analysis of Inverting and Non-inverting by Op-Amp	To realize inverting and non inverting amplifier configuration using Op-Amp IC-741.	C204.2
5.	Study and Analysis of Adder and Substractor by Op-Amp	To realize adder and substractor circuits using Op-Amp IC-741	C204.2
6.	Study and Analysis of Differentiator and Integrator by Op-Amp	To realize differentiator and integrator circuits using Op-Amp IC-741.	C204.2
7.	Study of Logic Gates and Verification of Boolean Laws	Verification of the truth tables of logic gates using ICs	C204.3
8.	Study and Implement of Basics Logics Gates using Universal Logic Gates	To implement basic logic gates AND, OR, NOT using NAND and NOR gates.	C204.3
9.	Perform the Boolean Expression using Universal Gates	To implement the Boolean expressions using NAND gates only: $(i)X = \overline{A + \bar{B}}$ $(ii)Y = \bar{A}B + C\bar{D}$ $(iii)Z = \overline{(A + \bar{B})(C + \bar{A})}$	C204.3
10.	Design and Implementation of Adders	To realize a Half Adder, Full Adder using logic gates.	C204.4
11.	Design and Implementation of Subtractors	To realize a Half Subtractor , Full Subtractor using logic gates.	C204.4
12.	Design and Implementation of Multiplexer	To realize 4:1 Multiplexer using NAND gates.	C204.4
13.	Study and Implement of Voltage Comparator using Op-Amp	To implement a Voltage Comparator circuit using Op-Amp	C204.2

14.	Study of Square Waveform using Op-Amp	To generate a Square Waveform using Op-Amp	C204. 2
15.	Study and Analysis of Filter in Op-Amp	To design a First Order Low Pass Filter	C204. 2

Evaluation Criteria

Components	**Maximum Marks**
Viva1	20
Viva2	20
Report file, Attendance, and D2D	60 (15+15+30)
Total	**100**

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.	Richard C. Dorf, James A. Svoboda, "Introduction to Electric Circuits," Wiley; 7 Edition, 2006
2.	M. Morris Mano, "Digital Design," 3rd Edition, PHI, 2002
3.	A. A. Kumar, "Fundamentals of Digital Circuits," 3rd Edition, PHI Learning Pvt. Limited, 2014
4.	D. Roy Choudhary and Shail B. Jain, " Linear Integrated Circuit," 2nd Edition, NAILP, 20 03

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B11CS211	**Semester** Odd **(specify Odd/Even)**	**Semester** 3rd **Session** 2019 -2020 **Month from** July to December
Course Name	Data Structures and Algorithms		
Credits	4	**Contact Hours**	4

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.	Analyzing [Level 4]
C210.2	Implement various linear and non linear data structures and their related operations.	Understanding [Level 2]
C210.3	Select and apply relevant data structure for a given problem and evaluate its performance.	Apply [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 5]

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Analysis of Algorithms	Introduction to problem solving approach; Growth of functions and solving recurrences; Notations- Big O, Big Omega, Big Theta;	3
2.	Linear DS: Arrays and related algorithms	Arrays: Storage , traversal, Searching (Linear, Binary, Median, Interpolation), Sorting (Selection, Insertion, Bubble, Merge, Quick), Applications and Manipulations.	7
3.	Linear DS: Stacks & Queues and related algorithms	Stacks and Queues using arrays and linked list, Circular Queue, Priority Queues using Binary Heap, Stack & Queue based applications.	4
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.	7
5.	Non-linear DS: Graphs and related algorithms	Graphs storage and basic algorithms, e.g., traversal (DFS/BFS), minimum spanning tree (Prims/Kruskal), Shortest paths in weighted and unweighted graphs.	5
6.	Algorithm Design Technique: Divide and Conquer	Fundamentals of Divide and Conquer (D&C) approach using Binary search, Quick sort, and Merge sort; Strassen's matrix multiplication; and Closest pair, etc.	2
7.	Algorithm Design Technique: Greedy	Introduction to greedy based solution approach; Minimum Spanning Trees (Prim's and Kruskal algorithms); Shortest Path using Dijkastra algorithm;	3

	Algorithms	Fractional and 0/1 Knapsack;Coinage problem; Job scheduling; Graph coloring;	
8.	Algorithm Design Technique: Backtracking Algorithms	Review of backtracking based solution approach using N queen; M-coloring problem; Hamiltonian Cycle detection; Travelling salesman problem; Network flow	3
9.	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; etc.	5
10.	String Algorithms	Naïve String Matching, Finite Automata Matcher, Rabin Karp matching algorithm, Knuth Morris Pratt.	3
		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**

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, 2nd Edition,2001
2	Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983
3	Weiss, Data Structures and Algorithm Analysis in C, Benjamin and Cummings Pub., 1994
	Steven Skiena ,The Algorithm Design Manual, Springer; 2nd edition , 2008
4	Fundamanetal of Data Structures in C++, Horobitz and Sahni and Mehta, 2009, Galgotia
5	Theory and Problems of Data Structures with C++, Shaum's outline, McGraw-hill, 2000
6	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978
7	ACM Transactions on Algorithms (TALG)

Detailed Syllabus

Course Code	18B15CS211	Semester: ODD (specify Odd/Even)	Semester 3rd Session 2019-2020 Month from July 19 to Dec 19
Course Name	Data Structures and Algorithms Lab		
Credits	0-0-2	Contact Hours	4

Faculty (Names)	Coordinator(s)	Shardha Porwal
	Teacher(s) (Alphabetically)	Dr. Nisha Chaurasia, Shardha Porwal, Dr. Vimal Kumar

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.	Understanding Level (C2)
C270.2	Interpret the complexity of algorithms for given problems.	Understanding 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 & Queue based 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 using Dijkastra 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	**Maximum Marks**
Lab Test-1	**20**
Lab Test-2	**20**
Day-to-Day (Project, Lab evaluations, Attendance)	**60**
Total	**100**

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, 2nd Edition,2001
2	Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison- Wesley Series in Computer Science and Information Processing, 1983
3	Weiss, Data Structures and Algorithm Analysis in C, Benjamin and Cummings Pub., 1994
4	Steven Skiena ,The Algorithm Design Manual, Springer; 2nd edition , 2008
5	Fundamanetal of Data Structures in C++, Horobitz and Sahni and Mehta, 2009, Galgotia
6	Theory and Problems of Data Structures with C++, Shaum's outline, McGraw-hill, 2000
7	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978
8	ACM Transactions on Algorithms (TALG)