Probability and Random Processes (15B11MA301)

Course Description

Course Code	15B11MA301	Semester Odd		Semester IIISession 2020-21 Month from Aug 2020–Dec 2020
Course Name	Probability and Random Processes			
Credits	4		Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Amit Srivastava and Dr. Neha Singhal		
	Teacher(s) (Alphabetically)	Dr. Amit Srivastava, Dr. Neha Singhal, Dr. Yogesh Gupta, Dr. Himanshu Agarwal, Dr. Trapti Neer, Dr. Lakhveer Kaur, Dr. Amita Bhagat		

COURSE OUTCOMES:		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
C201.1	explain the basic concepts of probability, conditional probability and Bayes' theorem	Understanding Level (C2)
C201.2	identify and explain one and two dimensional random variables along with their distributions and statistical averages	Applying Level (C3)
C201.3	apply some probability distributions to various discrete and continuous problems.	Applying Level (C3)
C201.4	solve the problems related to the component and system reliabilities.	Applying Level (C3)
C201.5	identify the random processes and compute their averages.	Applying Level (C3)
C201.6	solve the problems on Ergodic process, Poisson process and Markov chain.	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Probability	Three basic approaches to probability, conditional probability, total probability theorem, Bayes' theorem.	5
2.	Random Variables	One dimensional random variables (discrete and continuous), distribution of a random variable (density function and cdf). MGF and characteristic function of a random variable and its utility. Bivariate random variable, joint, marginal and conditional distributions, covariance and correlation.	8
3.	Probability Distributions	Bernoulli, binomial, Poisson, negative binomial, geometric distributions. Uniform, exponential, normal, gamma, Earlang and Weibull distributions.	8
4.	Reliability	Concept of reliability, reliability function, hazard rate function, mean time to failure (MTTF). Reliability of series, parallel, series-parallel, parallel-series systems.	6
5.	Random Processes I	Introduction, Statistical description of random processes, Markov processes, processes with independent increments. Average values of random processes. Strict sense and wide sense stationary processes, their averages. Random walk, Wiener process. Semi-random telegraph signal and random telegraph signal process. Properties of autocorrelation function.	7
6.	Random Processes II	Ergodic processes. Power spectral density function and its properties. Poisson processes. Markov chains and their transition probability matrix (TPM).	8
Total number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments, Tutorials)
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.	**Veerarajan, T.,** Probability, Statistics and Random Processes, 3rd Ed. Tata McGraw-Hill, 2008.
2.	**Papoulis, A. & Pillai, S.U.,** Probability, Random Variables and Stochastic Processes, Tata McGraw-Hill, 2002.
3.	**Ross, S. M.,** Introduction to Probability and Statistics for Engineers and Scientists, 4th Ed., Elsevier, 2004.
4.	**Palaniammal, S.,** Probability and Random Processes, PHI Learning Private Limited, 2012.
5.	**Prabha, B. and Sujata, R.,** Statistics, Random Processes and Queuing Theory, 3rd Ed., Scitech, 2009.

Probability and Statistics (15B11MA302)

Course Description

Course Code	15B11MA302	Semester:Odd		Semester: III, Session: 2020-21 Month: Aug 2020- Dec 2020
Course Name	Probability and Statistics			
Credits	4		**Contact Hours**	3-1-0
Faculty (Names)	**Coordinator(s)**	Dr. Richa Sharma		
	Teacher(s) (Alphabetically)	Dr. Richa Sharma		

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
C202.1	demonstrate different diagrammatic representation of data and explain the measures of central tendency, dispersion and asymmetry.	Understanding Level (C2)
C202.2	explain the concepts of probability theory and Bayes' theorem.	Understanding Level (C2)
C202.3	explain and solve the problems of probability distributions along with their mean, variance & moment generating functions.	Applying Level (C3)
C202.4	explain sampling theory and apply test of hypothesis on small and large samples.	Applying Level (C3)
C202.5	apply the method of least squares for curve fitting and explain correlation and regression.	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Classification of Data	Classification of data, graphic and diagrammatic representation of data, measures of central tendency and dispersion i.e. mean and standard deviation, measures of skew ness and kurtosis.	6
2.	Probability	Sample space and events, Permutations and combinations, Probability of an event, Axioms of probability, Equiprobable spaces, Conditional probability, Multiplication and addition theorems, Bayes' theorem, Independent events.	10
3.	Random Variables	Random Variable, Discrete and continuous distributions, Mean and variance of a random variable	4
4.	Probability Distributions	Binomial, Uniform, Normal and Poisson distributions.	8
5.	Sampling Theory	Test of hypothesis and significance. Test based on Exact (Small) Sampling- Chi-square test, t test and F test.	10
6.	Correlation and Regression	Curve fitting by the method of least squares, Correlation and regression.	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz , Assignments, Tutorials, PBL)
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.	**Walpole, R.E, Myers, R.H., Myers S.I and Ye. K**., Probability and Statistics for Engineers and Scientists, 8th Ed., Pearson, 2007
2.	**Papoulis, A. & Pillai, S.U.**, Probability, Random Variables and Stochastic Processes, Tata McGraw-Hill,

	2002.
3.	**Spiegel, M.R.,**Statistics (Schaum's oulines), McGraw-Hill, 1995
4.	**Veerarajan, T.,**Probability, Statistics and Random Processes, 3rd Ed. Tata McGraw-Hill, 2008.
5.	**Johnson, R.A.**, Miller and Freund's Probability and Statistics for Engineers, 8th Ed., PHI Learning Private limited, 2011
6.	**Palaniammal, S.,** Probability and Random Processes, PHI Learning Private limited, 2012

Course Code	15B11CI311	Semester Odd (specify Odd/Even)		Semester III Session 2020 -2021 Month from July to December	
Course Name	Data Structures				
Credits	4		**Contact Hours**	4	

Faculty (Names)	Coordinator(s)	Ms. AnkitaWadhwa (J62), RupeshKoshariya (J128)
	Teacher(s) (Alphabetically)	J62- Ms. AnkitaWadhwa, Dr. NiyatiAggarwal, Dr. ParulAgarwal, Ms. Sarishty Gupta J128- Dr. BinduVerma, Prof. Krishna Asawa, Dr. MukeshSaraswat, Mr. Rupesh Kumar Koshariya

COURSE OUTCOMES		COGNITIVE LEVELS
C210.1	Explain abstract data types, memory allocation schemes. and need of linear and non-linear data structures	Understand Level (Level 2)
C210.2	Apply OOPS concepts like Polymorphism, Templates, STL, *etc.*to implement various linear data structures, searching, and sorting	Apply Level (Level 3)
C210.3	Analyze the performance of various sorting and searching techniques	Analyze Level(Level 4)
C210.4	Demonstrate and implement various operations like search, traverse, insertion, deletion, *etc.* on different non-linear data structures	Understand Level (Level 2)
C210.5	Apply appropriate data structure to design an efficient solution for given and identified problem	Create Level(Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Fundamentals of Data Structures, Memory Allocation, Abstract Data Types, Linear and Non-Linear DS	2
2.	Linear Data Structures using Object Oriented Programming	Review of linear data structures; Basics of Object-oriented programming (OOPS) - Class Diagram and Relationship – Association, Aggregation, and Composition, Polymorphism, Templates, STL; Implementation of Array, Linked List, Stack and Queue using OOPS, Stack, and Queue operations using STL, Recursion removal using Stack; Multi List, List of List	13
3.	Searching and Sorting using Object Oriented Programming	Searching – Linear Search, Binary Search, Median Search; Hashing – Hash Table, Chaining, Probing;Sorting – Merge, Quick, Radix, Bucket, and Count; Time and Space complexity analysis of searching and sorting algorithms	9
4.	Non-Linear Data Structure – Tree	Binary Tree, K-ary Tree, Binary Search Tree, Threaded Tree, AVL Tree, B Tree, B+ Tree, Priority Queue using Binary Heap	11
5.	Non-Linear Data Structure – Graph	Fundamentals of Graph, Adjacency Matrix and List; Graph Traversal using DFS and BFS, Basic Algorithms – Shortest Path, Minimum Spanning Tree	5

6.	Performance Evaluation of Various Data Structures	Apply and evaluate performance of various data structures over following applications: Tower of Hanoi, Priority Queue, Expression Conversion and Evaluation, etc.	2
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Mini Project(10), Attendance(5),Assignments(5), Online Test(5))
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)

Text Book:

1	Dinesh P. Mehta and SartajSahni, Handbook of Data Structures and Applications, 2nd Ed., Chapman and Hall/CRC Computer and Information Science Series, CRC Press
2	Ellis Horowitz,SartajSahni and Dinesh P. Mehta, Fundamentals of Data Structures in C++, Galgotia Press, 2009
3	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 3rd Edition, 2009
4	Seymour Lipschutz, Data Structures with C, Schaum's Outline Series, McGraw Hill, 2010

Reference Book

1	Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983
2	John R. Hubbard, Data Structures with C++, Schaum's Outline Series, McGraw Hill, First Edition, 2017.
3	Robert Lafore, Object Oriented Programming in C++, SAMS, 2002

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11CI312	Semester : Odd	Semester :Odd Session : 2020-2021
			Month from July'20 toDec'20

Course Name	Database Systems & Web		
Credits	4	**Contact Hours**	**4(3+1)**

Faculty (Names)	Coordinator(s)	Neetu Sardana(J62), Vartika Puri(J128)
	Teacher(s) (Alphabetically)	Ankit Vidyarthi(J62), Mahendra Kumar Gurve(J62), AnubhutiRodaMohindra(J128), Swati Gupta(J128), Amrit Pal Singh(J128)

COURSE OUTCOMES		COGNITIVE LEVELS
C212.1	Explain the basic concepts of Database systems and Web components.	Understand Level (Level II)
C212.2	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)
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	Entity type, Attributes, Relation types, Notations, Constraints, Extended ER Features	4

		and ER Model		
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, buildingnormalised 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)

Text Books

1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 5th Edition, McGraw-Hill,2006
2.	RamezElmasri ,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 Web Development" by Luke Welling and Laura Thomson(Pearson Education)

Reference Books

1.	"PHP and MYSQL Manual" by Simon Stobart and Mike Vassileiou
2.	"An introduction to database systems" by Bipin C. Desai, West Publishing Company, College & School Division, 1990 - Computers - 820 pages
3.	Christopher J. Date, Database Design and Relational Theory: Normal Forms and All That Jazz, 2012.
4.	Rajiv Chopra, Database Management System (DBMS): A Practical Approach, 5th Edition, 2016, 682 pages.

Course Code	15B17CI372	Semester Odd-Special	Semester III Session 2020
			Month from June'21 **to** July'21

Course Name	Database System & Web Lab		

Credits	0-0-1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Aditi Sharma, Parul Agarwal, Payal Khurana Batra
	Teacher(s) (Alphabetically)	Aditi Sharma, Amarjeet Prajapati, Archana Purwar, Dhanlakshmi, Neetu Sardana, Niyati Aggrawal, Parmeet Kaur, Parul Agarwal, Prantik Biswas, Raghu Vamsi, Sherry Garg, Sulabh Tyagi, Vivek Kumar Singh, Vartika Puri , Swati Gupta

COURSE OUTCOMES		COGNITIVE LEVELS
CI271.1	Explain the basic concepts of Database systems and Web components.	Understand (Level II)
CI271.2	Develop web page using HTML, CSS with client side scripting using javascript.	Apply (Level III)
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 III)
CI271.4	Programming PL/SQL including stored procedures, stored functions, cursors, Triggers.	Apply (Level III)
CI271.5	Design and implement a database schema for a given problem-domain and normalize a database.	Creating (Level VI)
CI271.6	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.	CI271.3, CI271.5

		3. Design web application with databased connectivity. 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	**60**
(Project, Lab Assessment, 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.	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

15B11CI212   **Theoretical Foundations of Computer Science**

Subject Code	**15B11CI212**		Semester: **Special Semester**	Semester: Special Semester Session: 2021
				Month from June 21 to July 20
Subject Name	**Theoretical Foundations of Computer Science**			NBA Code: C211
Credits	4		Contact Hours	3L +1T

Faculty (Names)	Coordinator(s)	Mr. Mahendra Gurve (J62), Dr. Sakshi Gupta (J62), Dr. Himani Bansal (J128)
	Teacher(s) (Alphabetically)	Dr. Alka Singhal, Dr. Dhanalexmi, Dr. Dharmveer Singh Rajpoot, Mr. Mahendra Gurve, Dr. Sakshi Gupta, Ms. Sonal

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; 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**

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	15B11EC211	Semester Odd (specify Odd/Even)	Semester 3rd Session 2020 -2021 Month from August-December
Course Name	Electrical Science-2		
Credits	4	**Contact Hours**	3+1

Faculty (Names)	Coordinator(s)	Dr.SatyendraKumar, Dr.Kirmender Singh
	Teacher(s) (Alphabetically)	Dr.Akanksha Bansal, Mr.Ankur Bhardwaj, Dr.Archana Pandey, Dr.Atul Kumar, Dr. BhagirathSahu, Dr.BhartenduChaturvedi, Mr.Chandan Singh, Mr.Deepak Kumar, Dr.GarimaKapur, Dr.Hemant Kumar, Dr.Jitendra Mohan, Dr.Kaushal Nigam, Ms. Madhu Jharia, Mr.MandeepNarula, Mr.Nitesh Kumar, Dr.Pankaj Kumar Yadav, Mr. Prabhakar, Dr.Rachna Singh, Mr.Rahul Kumar,Dr.Rubi Beniwal, Mr.ShivajiTyagi, Ms.ShradhaSaxena, Dr.Vimal Kumar Mishra, Mr.Vimal Saini, Dr.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.	Analyzing Level (C4)
C203.2	Understand two-port network parameters. And study operational amplifier, first-order and second -order filters.	Understanding Level (C2)
C203.3	Study the properties of different types of semiconductors, PN junction diode, zener diode and analyze diode applications.	Analyzing Level (C4)
C203.4	Study the characteristics, operation of bipolar junction transistor (BJT) and its biasing, stability aspects.	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	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 conductivity equation.	6
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**

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 and James A. Svoboda, "Introduction to Electric Circuits",9th ed, John Wiley & Sons, 2013.
2.	Charles K. Alexander ,Matthew N.OSadiku,"Fundamentals of Electric Circuits", 6th Edition, Tata McGraw Hill,2019.
3.	Abhijit Chakrabarti, Circuit Theory Analysis and Synthesis,7thed, Dhanpat Rai & Co.2018.
4.	Robert L. Boylestad, Louis Nashelsky,"Electronic Devices and Circuit Theory", 11thed, Prentice Hall of India,2014.
5.	Jacob Millman,Millman'sElectronicDevicesandCircuits (SIE),4thed,McGrawHillEducation,2015.

Course Description

Course Code	15B17EC271	Semester -: Odd (specify Odd/Even)	Semester-: III, Session 2020 -2021 Month- : July - December
Course Name	Electrical Science-2 Lab		
Credits	2	Contact Hours	2

Faculty (Names)	Coordinator(s)	Mr. Ankur Bhardwaj, Dr. Yogesh Kumar, Dr. Abhishek Kashyap
	Teacher(s)	Shamim Akhter, Jasmine Saini, Ruby Beniwal, Nisha Venkatesh, Ankur Bhardwaj, Rachna Singh, Atul Kumar, Alok Joshi, B. Suresh, Kuldeep Baderia, Vinay Tikkiwal, Vishal Narain Saxena, Vimal Mishra, Priyanka Gandhi, Abhay Kumar, Monika, Yogesh Kumar, Abhishek Kashyap

COURSE OUTCOMES		COGNITIVE LEVELS
C204.1	Understand Transient analysis and steady state response of series RC circuit.	Understanding (Level II)
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 IV)
C204.3	Study and Implementation of the different logic gates.	Remembering (Level I)
C204.4	Construct Adder, Subtractor and Multiplexer circuits using logic gates.	Applying (Level III)

Module No.	Title of the Module	List of Experiments	COs
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 circuits.	C204.1

	Analysis of Series Resonance 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: $(i)X = \overline{A + \overline{B}}$ $(ii)Y = \overline{A}B + C\overline{D}$ $(iii)Z = \overline{(A + \overline{B})(C + \overline{A})}$	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	To implement a Voltage Comparator circuit using Op-Amp	C204.2

	using Op-Amp		
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**

Project Based Learning: Students will learn about resonance in RLC circuits and use that in designing filters. Realizing mathematical operators using Op-amp enables student to use Op-amp along with other logic gates to design complex digital circuits.

	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

Course Code	15B17CI371	Semester : Odd	Semester 3rd Session 2020 -2021
			Month from July-Dec 2020 (Due to Covid19 conducted in Special Semester in summer 2021**)**
Course Name	**Data Structure LAB**		
Credits	2	**Contact Hours**	4

Faculty (Names)	Coordinator(s)	Dr. Manish K Thakur / Dr. Bhawna Saxena
	Teacher(s) (Alphabetically)	J62 - Ankita, Anuja Arora, Bharat Gupta, Bhawna Saxena, K Vimal Kumar, Manish K Thakur, P. Raghu Vamsi, Prakash Kumar, Purtee Kohli, Satish Chandra
		J128 -Ambalika Sarkar, Arti Jain, Himani Bansal, Krishna Asawa, Raju Pal, Shariq Murtuza, Varsha Garg

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Develop programs using object oriented programming (C++) including STL	Apply Level (C3)
CO2	Develop various searching (Linear, Binary, Interpolation, Median) and sorting (Merge, Radix, and Quick) algorithms	Apply Level (C3)
CO3	Experiment with lists, multi linked list for sparse matrix representation, rat in a maze problem, n queens problem, etc.	Apply Level (C3)
CO4	Develop the programs for different tree data structure operations like, storage, search, traverse, insertion, deletion, updating, etc. on binary trees, k-ary trees, binary search trees, AVL trees, heap trees, B trees and B+ trees.	Apply Level (C3)
CO5	Develop the various operations (Storage, Search, Traverse, Insertion, Deletion, Updating, Path finding, Minimum spanning tree etc.) on different Graph data structures.	Apply Level (C3)
CO6	Develop the programs for priority queue and hashing techniques.	Apply Level (C3)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction	*Fundamentals of Data Structures, Memory Allocation, Abstract Data Types, Linear and Non Linear DS*	CO1
2.	Linear Data Structures using Object Oriented Programming	*Review of linear data structures; Basics of Object oriented programming (OOPS) - Class Diagram and Relationship – Association, Aggregation, and Composition, Polymorphism, Templates, STL; Implementation of Array, Stack and Queue using OOPS, Stack, and Queue operations using STL;*	CO1
3	*Lists*	*Introduction to lists, multi linked list for sparse matrix representation, rat in a maze problem, n queens problem*	CO3

3.	*Searching and Sorting using Object Oriented Programming*	*Searching – Linear Search, Binary Search, Median Search; Hashing – Hash Table, Chaining, Probing; Sorting – Merge, Quick, Radix, Bucket, and Count; Time and Space complexity analysis of searching and sorting algorithms*	CO2
4.	Non-Linear Data Structure – Tree	*Binary Tree, K-ary Tree, Binary Search Tree, Threaded Tree, AVL Tree, B Tree, B+ Tree, Priority Queue using Binary Heap*	CO4
4.	Non-Linear Data Structure – Graph	*Fundamentals of Graph, Adjacency Matrix and List; Graph Traversal using DFS and BFS, Basic Algorithms – Shortest Path, Minimum Spanning Tree*	CO5
5.	Performance Evaluation of Various Data Structures	*Apply and evaluate performance of various data structures over following applications: Tower of Hanoi, Priority Queue, Expression Conversion and Evaluation, etc.*	CO6
6.	Hashing	Introduction to hashing, Collision resolution – open and closed hashing methods, Cuckoo hashing, Coalesced Hashing, Perfect Hash function, Universal Hashing.	CO6

Evaluation Criteria

Components	Maximum Marks
Lab Test -1	**20**
Lab Test -2	**20**
Lab Evaluation	**20**
Mini-Project	**15**
Lab Quiz	**10**
Attendance	**15**
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	Dinesh P. Mehta and Sartaj Sahni, Handbook of Data Structures and Applications, 2nd Ed., Chapman and Hall/CRC Computer and Information Science Series, CRC Press
2	Ellis Horowitz, Sartaj Sahni and Dinesh P. Mehta, Fundamentals of Data Structures in C++, Galgotia Press, 2009
3	Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983
4	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 3rd Edition, 2009
5	Robert Lafore, Object Oriented Programming in C++, SAMS, 2002

Course Code	15B11HS211	Semester : ODD (specify Odd/Even)	Semester : III Session 2020-21 Month from:Aug-December
Course Name	Economics		
Credits	03	Contact Hours	2-1-0

Faculty (Names)	Coordinator(s)	ManasRanjanBehera, Dr.AnshuBanwari
	Teacher(s) (Alphabetically)	Dr.Akarsh Arora, Dr.Amandeep Kaur, Dr.AnsuBanwari, Dr. KanupriyaMisraBakhru,ManasRanjanBehera, Dr. Mukta Mani Dr.SakshiVarshney, Dr.ShirinAlavi

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,	5

		Oligopoly	
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 (Project+ClassTest+Attendance and Discipline)
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.