Detailed Syllabus

Lecture-wise Breakup

Course Code	15B11CI212	**Semester:** Odd	**Semester**: III **Session**: 2020-21 **Month from**: Aug 2020 to Dec 2020 **(Due to COVID-19 pandemic, it was run in Fast Track mode from June'21 to Jul'21)**
Course Name	Theoretical Foundations of Computer Science		
Credits	4	**Contact Hours**	3-1-0

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 [Level 3]
C211.2	Evaluate Boolean functions and Analyze algebraic structure using the properties of Boolean algebra	Evaluate Level [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	Analyze Level [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 [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 [Level 3]
C211.6	Explain basic concepts of automata theory and formal languages e.g. Finite automata, regular expressions, context-free grammars etc.	Understand Level [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	6

		Representation of Relations; Matrix Representation of Relations; Closure of Relations.	
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**	
Test -1	20	
Test -2	20	
End Sem	35	
TA	25	(Performance, Tutorial Assignment 15 Attendance 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.	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	**Semester:** III **Session:** 2020-2021 **Month from** Aug 2020 to Dec 2020
Course Name	Database Systems & Web		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Neetu Sardana(J62), Vartika Puri(J128)
	Teacher(s) (Alphabetically)	Ankit Vidyarthi(J62), Mahendra Kumar Gurve(J62), Anubhuti Roda Mohindra(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 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)

Text Books

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 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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11EC211	**Semester:** Odd	**Semester:** III **Session** 2020 -2021 **Month from** Aug 2020 to Dec 2020
Course Name	Electrical Science-2		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Dr.Satyendra Kumar, Dr.Kirmender Singh
	Teacher(s) (Alphabetically)	Dr.Akanksha Bansal, Mr.Ankur Bhardwaj, Dr.Archana Pandey, Dr.Atul Kumar, Dr. Bhagirath Sahu, Dr.Bhartendu Chaturvedi, Mr.Chandan Singh, Mr.Deepak Kumar, Dr.Garima Kapur, Dr.Hemant Kumar, Dr.Jitendra Mohan, Dr.Kaushal Nigam, Ms. Madhu Jharia, Mr.Mandeep Narula, Mr.Nitesh Kumar, Dr.Pankaj Kumar Yadav, Mr. Prabhakar, Dr.Rachna Singh, Mr.Rahul Kumar, Dr.Rubi Beniwal, Mr.Shivaji Tyagi, Ms.Shradha Saxena, 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.	Analyze Level (C4)
C203.2	Understand two-port network parameters. And study operational amplifier, first-order and second -order filters.	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 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,7th ed, 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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11HS211	**Semester:** Odd	**Semester**: III **Session:** 2020-21 **Month from** Aug 2020 to Dec 2020
Course Name	Economics		
Credits	3	**Contact Hours**	2-1-0

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

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

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17CI372	**Semester:** Odd	**Semester:** III **Session:** 2020-2021 **Month from** Aug 2020 to Dec 2020 **(Due to COVID-19 pandemic, it was run in Fast Track mode from June'21 to Jul'21)**
Course Name	Database System & Web Lab		
Credits	1	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	Aditi Sharma, Parul Agarwal, Payal 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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C1271.1	Explain the basic concepts of Database systems and Web components.	Understand level (Level 2)
C1271.2	Develop web page using HTML, CSS with client side scripting using javascript.	Apply level (Level 3)
C1271.3	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)
C1271.4	Programming PL/SQL including stored procedures, stored functions, cursors, Triggers.	Apply level (Level 3)
C1271.5	Design and implement a database schema for a given problem-domain and normalize a database.	Create level (Level 6)
C1271.6	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.	C1271.1
2.	Client Side Web Technology	1. Design web page using SGML, HTML 5, DHTML, CSS, Java script.	C1271.2
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 - databse interaction through PHP.	C1271.3, C1271.5

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	C1271.4
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.	C1271.4
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.	C1271.5, C1271.6

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

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.	Understand level (Level 2)
C204.2	Acquire the knowledge of circuits like Adder, Subtractor, Integrator, differentiator; inverting and non inverting amplifier circuits realized using Op-amp IC-741.	Analyze level (Level 4)
C204.3	Study and Implementation of the different logic gates.	Remember level (Level 1)
C204.4	Construct Adder, Subtractor and Multiplexer circuits using logic gates.	Apply level (Level 3)

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	Analysis of Series Resonance circuits.	C204.1
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	Verification of the truth tables of logic gates using ICs	C204.3

	Boolean Laws		
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**

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

Detailed Syllabus

Lecture-wise Breakup

Course Code	16B1NMA533	**Semester:** Odd	**Semester:** III **Session:** 2020 -2021 **Month from** Aug 2020 to Dec 2020
Course Name	Matrix Computations		
Credits	3	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Amita Bhagat and Dr. Neha Singhal	
	Teacher(s) (Alphabetically)	Dr. Amita Bhagat, Dr. DCS Bisht, Dr. Neha Singhal, Dr. Pato Kumari	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-3.1	Explain the basics of matrix algebra and inverse of a matrix by partitioning.	Understand level (C2)
C301-3.2	Solve the system of linear equations using direct and iterative methods.	Apply Level (C3)
C301-3.3	Explain the vector spaces and their dimensions, inner product space, norm of a vector and matrix.	Understand level (C2)
C301-3.4	Apply the Gram-Schmidt process to construct orthonormal basis and Q-R decomposition of a matrix.	Apply Level (C3)
C301-3.5	Construct Gershgorin's circles and solve eigenvalue problem using Jacobi, Givens, Housholder, power and inverse power methods.	Apply Level (C3)
C301-3.6	Analyse systems of differential and difference equations arising in dynamical systems using matrix calculus.	Analyze Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Matrix Algebra	Review of matrices, partitioning, block diagonal matrix, elementary matrices, Inverse of a matrix by partitioning.	6
2.	Linear System of equations	Existence and uniqueness of solution for system of linear equations. Partial pivoting, LU decomposition, Crout's and Doolittle's methods, Cholesky factorization. Gauss Siedel, Gauss Jacobi iterative methods.	6
3.	Vector and Inner Product Spaces	Vector spaces, Subspaces, dimension and basis, *p*-norms of vector, Inner product, Norm using inner product and norms of a matrix.	6
4.	Orthogonality	Orthogonal and orthonormal sets, Gram-Schmidt process, QR factorization.	4

5.	Eigen value Problems	Eigen values and Eigenvectors, spectral radius, Greshgorin's theorem, Jacobi method, Givens rotations method and Householder's method, Power and Inverse power methods, Q-R algorithm.	12
6.	Matrix Calculus	Powers and functions of matrices, application to solve discrete dynamical systems $x(t+1) = Ax(t)$, $x(0) = \alpha$ and a system of differential equations of the form $dx/dt = Ax$, $x(0) = \alpha$.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Quizzes and Tutorial)
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.	**Bronson, R**., Matrix Methods an Introduction, Academic Press, 1991.
2.	**Golub, G. H., Loan, C. F. V.,** Matrix Computations, 4th Edition, Johns Hopkins University Press, 2013.
3.	**Datta, K. B.**, Matrix and Linear Algebra, 3rd Edition, Prentice Hall of India, 2016.
4.	**David, W. Lewis**., Matrix Theory, World Scientific, 1991.

Detailed Syllabus

Lecture-wise Breakup

Course Code	17B1NMA531	**Semester:** Odd	**Semester:** III **Session** 2020-21 **Month from** Aug 2020 to Dec 2020	
Course Name	Basic Numerical Methods			
Credits	3		**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Lokendra Kumar and Dr. Pankaj Kumar Srivastava		
	Teacher(s) (Alphabetically)	Dr. Lokendra Kumar, Dr. Trapti Neer, Dr. Pankaj Kumar Srivastava, Dr. DCS Bisht		

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-5.1	explain the concepts of approximation and errors in computation.	Understand level (C2)
C301-5.2	construct numerical methods for algebraic and transcendental equations and their convergence.	Apply Level (C3)
C301-5.3	outline the methods of interpolation using finite differences and divided difference formulas.	Understand level (C2)
C301-5.4	make use of numerical differentiation and integration.	Apply Level (C3)
C301-5.5	solve the system of linear equations using direct and iterative methods.	Apply Level (C3)
C301-5.6	solve ordinary differential equations using different numerical methods.	Apply Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Approximation and Errors in Computation	Errors, relative error, absolute error, error in series approximation.	02
2.	Algebraic and Transcendental Equations	Bisection Method, Regula- Falsi Method, Secant Method, Iterative method, Newton-Raphson Method, convergence.	07
3.	Interpolation	Finite Differences, Relation between difference operators, Newton's Forward and Backward Interpolation, Gauss Backward Interpolation, Bessel's and Sterling's central difference operators, Laplace-Everett's formula, Newton's divided difference formula, Lagrange's interpolation formula.	08
4.	Numerical Differentiation and Integration	Derivatives using Newton's Forward and Backward Interpolation, Bessel's and Sterling's central difference operators, Maxima and minima of a tabulated function. Trapezoidal, Simpson's, Boole's and Weddle's rules, Euler-Maclaurin formula.	11
5.	System of Linear Equations	Gauss Elimination method, LU decomposition method, Gauss-Seidel Method.	05
6.	Numerical Solution of Ordinary	Picard's method, Euler's method, Modified Euler's method, Fourth order Runge-Kutta method, Milne's method for first order, second order and simultaneous differential equations, Finite-Difference Method	09

	Differential Equations		
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.	**C. F. Gerald and P.O. Wheatley,** Applied Numerical Analysis, 7th Ed., Pearson Education, 2004.
2.	**M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, 6th Ed., New Age International, New Delhi, 2014.
3.	**R. S. Gupta,** Elements of Numerical Analysis, 2nd Ed., Cambridge University Press, 2015.
4.	**S.D. Conte and C. deBoor,** Elementary Numerical Analysis, An Algorithmic Approach, 3rd Ed., McGraw-Hill, New York, 1980.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B11CS211	**Semester** Odd	**Semester:** III **Session** 2020 -2021 **Month from** Aug 2020 to Dec 2020
Course Name	Data Structures and Algorithms		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Bharat Gupta
	Teacher(s) (Alphabetically)	Bharat Gupta

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.	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 Algorithms	Introduction to greedy based solution approach; Minimum Spanning Trees (Prim's and Kruskal algorithms); Shortest Path using Dijkastra algorithm; Fractional and 0/1 Knapsack;Coinage problem; Job scheduling; Graph coloring;	3

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 (Attendance (10), Quiz/ Assignments in PBL mode/etc (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)

Text Book

1	Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithms, MIT Press, 3rd Edition, 2009

References

1	Narasimha Karumanchi, Data Structures And Algorithms Made Easy, CareerMonk Publications, 2017
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)

Detailed Syllabus

Course Code	18B15CS211	**Semester:** Odd	**Semester:** III **Session** 2020-2021 **Month from** Aug 2020 to Dec 2020 **(Due to COVID-19 pandemic, it was run in Fast Track mode from June'21 to Jul'21)**
Course Name	Data Structures and Algorithms Lab		
Credits	4	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	Dr. Dharmveer Singh Rajpoot, Dr. Suma Dawn
	Teacher(s) (Alphabetically)	Dr. Dharmveer Singh Rajpoot, Dr. Hema N, Dr. Kavita Pandey, Dr. K Rajalakshmi, Ms. Sonal, Dr. Suma Dawn

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 algorithms	Graphs storage and basic algorithms, e.g., traversal (DFS/BFS), minimum spanning tree (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;	C270.5
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 (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)