Detailed Syllabus
Lecture-wise Breakup

Subject Code	**15B11CI212**	Semester: **ODD**	Semester: **III** Session**: 2022-23**
			Month from **Aug-22 to Dec-22**
Subject Name	**Theoretical Foundations of Computer Science**		
Credits	**4**	Contact Hours	**3-1-0**

Faculty (Names)	Coordinator(s)	Dr. Ankita Verma & Dr. Kavita Pandey (JIIT62), Mr. Himanshu Agrawal (JIIT128)
	Teacher(s) (Alphabetically)	Dr. Amit Mishra, Dr. Ankita Verma, Dr. Arti Jain, Dr. Ashish Kumar, Dr. Dharmveer Singh Rajpoot, Mr. Himanshu Agrawal, Dr. Kavita Pandey, Dr. Mukta Goyal Dr. Pratishtha, Dr. Sakshi Gupta

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

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,	4

		Recursively defined functions, Cardinality, Modeling using Recurrence Relation, Solution of Recurrence Relations, Linear Recurrence Relation with Constant Coefficients.	
4.	Algebraic Structures	Binary Operations: semi-group, group; Subgroup: Cosets; Ring; Field; Boolean algebra; Binary Arithmetic.	4
5.	Logics	Proposition, Logical Operators, Tautology, Contradiction, Logical Equivalence, Tautological Implication, Converse, Inverse, and Contrapositive, Normal Forms, Arguments validity check, Predicates, Methods of Proof.	5
6.	Counting and Combinatorics	Basic Counting Principle, Permutations and Combinations, Binomial Coefficients, Pigeonhole principle.	3
7.	Graph Theory	Different Types of Graphs, Subgraphs, Operations on Graphs, Walk, Path, and Circuit; Connected Graph, Disconnected Graph, and Components; Euler and Hamiltonian Graphs; Planar Graph; Coloring of Graphs.	5
8.	Automata Theory	Regular Languages: Deterministic finite automata, Non-deterministic finite automata, Regular Expression; Context Free Languages; Turing machine.	11
Total number of Lectures			**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25(Attendance (10), Assignments/Mini-project (15))
Total	**100**
Project Based Learning: All students have to make group of 3-4 students for developing their assignments/ mini-project based on the course topics.	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Rosen, K. H., Discrete Mathematics and Its Applications with Combinatorics and Graph Theory, Tata McGraw-Hill, 2017.
2.	Liu, C. L., Elements of Discrete Mathematics, Tata McGraw-Hill, 2018.
3.	Linz, P, An Introduction To Formal Languages And Automata, Narosa Publishing House, 2013.
4.	Sipser, M., Introduction to the Theory of Computation, Second Edition, Thomson Course Technology, 2012.

Course Code	15B11CI312	Semester: **ODD**	Semester: **III** Session**: 2022-23**
			Month from **Aug-22 to Dec-22**

Course Name	Database Systems & Web		
Credits	4	**Contact Hours**	**3-1-0**

Faculty (Names)	Coordinator(s)	Janardan Verma, Dr. Payal
	Teacher(s) (Alphabetically)	Aditi Sharma, Ankit Vidyarthi, Bhawna Saxena, Indu Chawla, Kirti Aggarwal, MeghaRathi, Dr. Neetu Sardana, Parmeet Kaur, Dr. Payal, Sonal

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Databases	Introduction to Databases, Physical Level of Data Storage, Structure of relational databases, Review of SQL Create, Insert, Update, Delete and Select Statements, Overview of NoSQL databases	4
2.	Web Architecture & Introduction	Motivation, characteristics and complexities of web applications, Basics, of Web Server and Application server, differences between web application and conventional software, architecture layers.	2
3.	Client Side Web Technology	SGML, HTML 5, DHTML, CSS, Java script	3
4.	Server Side Web Technology	PHP, Database Connectivity with PHP	4

5.	Database Design and ER Model	Entity type, Attributes, Relation types, Notations, Constraints, Extended ER Features	4
6.	Relational Model 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(Attendance:10, Assignments/Min-Project/Class Test/Quiz/Tutorial):15
Total	**100**

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

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

1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 6th Edition, McGraw-Hill,2010
2.	RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 6th Edition, Pearson Education, 2011.
3.	Ramakrishnan, Gehrke, Database Management Systems, Mcgraw-Hill, 3rdEdition,Addison-Wesley,2006.
4.	Thomas Connolly, Carolyn Begg, Database Systems-A Practical Approach to design, Implementation and Management, 6th Edition, Pearson Education,2015.
5.	"PHP and MYSQL Manual" by Simon Stobart and Mike Vassileiou
6.	"PHP and MYSQL Web Development" by Luke Welling and Laura Thomson(Pearson Education)
7.	"An introduction to database systems" by Bipin C. Desai, West Publishing Company, College & School Division, 1990 - Computers - 820 pages
8.	Christopher J. Date, Database Design and Relational Theory: Normal Forms and All That Jazz, 2012.
9.	Rajiv Chopra, Database Management System (DBMS): A Practical Approach, 5th Edition, 2016, 682 pages.

Course Code	15B17CI372	Semester: **ODD**	Semester: **III** Session**: 2022-23**
			Month from **Aug-22 to Dec-22**

Course Name	Database System & Web Lab		
Credits	2	**Contact Hours**	0-0-1

Faculty (Names)	**Coordinator(s)**	Aditi Sharma, Kritika Rani
	Teacher(s) (Alphabetically)	Dr Ankit Vidyarthi, Anuradha Surolia, Dr Archana Purwar, Dr Bhawna Saxena, Dr Devpriya Soni, Dr Indu Chawla, Dr Megha Rathi, Dr Neetu Sardana, Dr Parmeet Kaur, Dr Payal Khurana Batra

	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. 3. Design web application with database connectivity. 4. Design web application with entering user data into database. **5.** Design web application for user - database interaction through PHP.	CI271.3, CI271.5
4.	SQL	Simple Queries, Sorting Results (ORDER BY Clause), SQL	CI271.4

		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	
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 database to execute insert, update, retrieve and delete data queries.	CI271.5, CI271.6

Evaluation Criteria

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

Project based learning: Each student in a group of 3-4 will have to develop a project based on different real-world problems. Students have to study the Web and database related Technologies before finalizing the objectives. For handling the multiple records they will implement cursors ad triggers. Student will design the webpage of the application area and connect with the database. Project development will enhance the knowledge and employability of the students in IT sector.

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

1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 7th Edition, McGraw-Hill,2019
2.	Ramez Elmasri , Shamkant B. Navathe , Fundamentals of Database Systems, 5th Edition, Pearson Education, 2015.
3.	Ramakrishnan, Gehrke, Database Management Systems, Mcgraw-Hill, 3rd Edition, Addison-Wesley, 2014.
4.	Thomas Connolly, Carolyn Begg, Database Systems-A Practical Approach to design, Implementation and Management, 6rd Edition, Addison-Wesley,2015.
5.	"PHP and MYSQL Manual" by Simon Stobart and Mike Vassileiou
6.	"PHP and MYSQL Web Development" by Luke Welling and Laura Thomson(Pearson Education), 5th Edition, 2016.

Course Code	15B11EC211	Semester: **ODD**	Semester: **III** Session**: 2022-23**
			Month from **Aug-22 to Dec-22**

Course Name	Electrical Science-2		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	Coordinator(s)	Yogesh Kumar and Shradha Saxena
	Teacher(s) (Alphabetically)	Abhishek Kashyap, Atul Kumar, Jitendra Mohan, Sajaivir Singh, Satyendra Kumar, Varun Goel, Vinay Kumar, Mandeep Singh Narula, Pankaj Kumar Yadav, Shivaji Tyagi, K. Nisha, Atul Kumar Srivastava

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&second-orderfilters.	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	6

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

Evaluation Criteria

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

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

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

1.	R. C. Dorfand James A. Svoboda, "Introduction to Electric Circuits", 9thed, John Wiley & Sons, 2013.
2.	Charles K. Alexander, Matthew N.O. Sadiku, "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's Electronic Devices and Circuits (SIE), 4thed, McGraw Hill Education, 2015.

Course Code	15B11HS211	Semester: **ODD**	Semester: **III** Session**: 2022-23**
			Month from **Aug-22 to Dec-22**

Course Name	Economics		
Credits	03	**Contact Hours**	2-1-0

Faculty (Names)	Coordinator(s)	Dr. Amandeep Kaur (JIIT62) Dr. Amba Agarwal (J128)
	Teacher(s) (Alphabetically)	Dr. Akarsh Arora Dr. Kanupriya Misra Bakhru Dr. Sakshi Varshney

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

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

		returns, Return to scale.	
6.	Cost Theory and Analysis	Nature and types of cost. Cost functions- short run and long run Economies and diseconomies of scale	2
7.	Market Structure	Market structure and degree of competition Perfect competition Monopoly Monopolistic competition Oligopoly	6
8	National Income Accounting	Overview of Macroeconomics, Basic concepts of National Income Accounting,	2
9	Macro Economics Issues	Introduction to Business Cycle, Inflation-causes, consequences and remedies: Monetary and Fiscal policy.	2
		Total number of Lectures	28 (lectures)

Evaluation Criteria

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

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

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	H.C. Petersen, W.C. Lewis, *Managerial Economics*, 4th ed., Pearson Education 2001.
2.	D. Salvatore, Managerial Economics in a Global Economy, 8th ed., Oxford University Press, 2015.
3.	S. Damodaran, Managerial Economics, 2 nd ed., Oxford University Press, 2010.
4.	M. Hirschey, Managerial Economics, 12th ed., Cengage India, 2013.
5.	P.A. Samuelson, W.D. Nordhaus, S. Nordhaus,Economics,18th ed., Tata Mc-Graw Hill, 2006.
6.	S.K. Misra& V. K. Puri, Indian Economy, 38th ed., Himalaya Publishing House, 2020.

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17EC271	Semester: ODD	Semester: III Session: 2022-23 Month from Aug-22 to Dec-22
Course Name	Electrical Science Lab-II		
Credits	1	Contact Hours	0-0-2

Faculty (Names)	Coordinator(s)	Dr. Abhishek Kashyap, Mr. Shivaji Tyagi
	Teacher(s)	Prof. Jitendra Mohan, Prof. Sajaivir Singh, Dr. Bajrang Bansal, Dr. Yogesh Kumar, Dr. Abhishek Kashyap, Dr. Atul Kumar, Dr. Hemant Kumar, Dr. Kapil Dev Tyagi, Dr. Kaushal Nigam, Dr. Satyendra Kumar, Dr. Varun Goel, Mr. Vinay Tikkiwal, Mr. Shivaji Tyagi, Dr. Vijay Khare, Dr. Gaurav Khanna, Ms. K. Nisha, Dr. Ankur Bhardwaj, Mr. Atul Kumar Srivastava, Mr. Vishal Narain Saxena, Ms. Bhawna Gupta, Mr. Mandeep Narula, Mr. Ritesh Kumar Sharma, Dr. Garima Kapur, Dr. Ajay Kumar, Dr. Samriti Kalia, Mrs. Smriti Bhatnagar, Ms. Shradha Saxena

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

Module No.	Title of the Module	List of Experiments	COs
1.	First and Second order passive circuits	Study the transient response of a series RC circuit and understand the time constant concept using pulse waveforms.	C204.1
		Study of Time Response of R-L-C Network	C204.1
2.	Two port resistive networks	To determine the Z-parameters of a 2- port resistive network.	C204.2
		To determine the h-parameters of a two-port resistive network.	C204.2
3.	Operational amplifier and its applications	To realize inverting and non inverting configurations using Op- Amp IC 741 amplifier.	C204.2
		To realize an adder and substractor circuits using Op- Amp IC 741 amplifier.	C204.2

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

Evaluation Criteria

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

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

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

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

Course Code	18B11CS211	Semester: **ODD**	Semester: **III** Session**: 2022-23** Month from Aug-22 to Dec-22
Course Name	Data Structures and Algorithms		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	Coordinator(s)	Dr. Arpita Jadhav Bhatt
	Teacher(s) (Alphabetically)	Dr. Arpita Jadhav Bhatt

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.	Introduction to DS and Algorithms	Fundamentals of Data Structures, Memory Allocation, Abstract Data types, Linear and non-linear DS. Introduction to problem solving approach; Growth of functions and solving recurrences; Notations- Big O, Big Omega, Big Theta;	4
2.	Linear Data Structures	Implementation of Arrays: Storage, traversal, Searching (Linear) and Sorting (selection, bubble, insertion) . Implementation of Linked List: Singly, Doubly, Circular. Implementation of Stack and Queue.	7
3.	Non-linear DS: Trees and related algorithms	Insertion, deletion and search operations in Binary Tree, BST, AVL. Priority queue using binary heap. Fundamentals of Graphs: Adjacency matrix and list; traversal (DFS/BFS) .	9
4.	Algorithm Design Technique: Divide and Conquer	Fundamentals of Divide and Conquer (D&C) approach using Binary search, Median Search, Quick sort, and Merge sort and Closest pair, etc.	3
5.	Algorithm Design Technique: Greedy Algorithms	Fundamentals of greedy based solution approach using Minimum Spanning Trees (Prim's and Kruskal algorithms); Shortest Path using Dijkastra algorithm; Fractional Knapsack; Coinage problem etc	4

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

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance (10), Project based learning (10) Assignments (5))
Total	**100**

Project based learning: Every student works in a group (2-3 students) for creating mini-project using C++ language and applications of the alogorithms. Algorithms are used in every part of computer science as they form application's or a project's backbone. C++ language provides a platform for the students to analyze, develop and debug programs and helps in their employability as software organizations prefer candidates having prior knowledge of C++ language and alogorithms.

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.	Leiserson, Charles E.., Stein, Clifford., Rivest, Ronald L.., Cormen, Thomas H.. Introduction to Algorithms, Fourth Edition. United States: MIT Press, 2022.
2.	Anggoro, Wisnu. C++ Data Structures and Algorithms: Learn how to Write Efficient Code to Build Scalable and Robust Applications in C++. India: Packt Publishing, 2018.
3.	Carey, John., Doshi, Shreyans., Rajan, Payas. C++ Data Structures and Algorithm Design Principles: Leverage the Power of Modern C++ to Build Robust and Scalable Applications. United Kingdom: Packt Publishing, 2019.
4.	Drozdek, Adam. Data structures and algorithms in C++. United States: Cengage Learning, 2005.
Reference Books and Material
5.	Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983
6.	Weiss, Data Structures and Algorithm Analysis in C, Benjamin and Cummings Pub., 1994
7.	Fundamanetal of Data Structures in C++, Horobitz and Sahni and Mehta, 2009, Galgotia
8.	Theory and Problems of Data Structures with C++, Shaum's outline, McGraw-hill, 2000
9.	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978
10.	ACM Transactions on Algorithms (TALG)

Detailed Syllabus
Lab-wise Breakup

Subject Code	18B15CS211	Semester: **ODD**	Semester: **III** Session**: 2022-23** Month from **Aug-22 to Dec-22**
Subject Name	Data Structures and Algorithms Lab		
Credits	4	**Contact Hours**	0-0-2

Faculty (Names)	Coordinator(s)	Dr. Apeksha Aggarwal
	Teacher(s) (Alphabetically)	Dr. Apeksha Aggarwal, Dr. Shikha Jain

COURSE OUTCOMES		COGNITIVE LEVELS
C274.1	Demonstrate the use of basic data structure and algorithm design such as Linked lists, Stacks, Queues, and others, for various applications.	Understanding Level (C2)
C274.2	Interpret the complexity of algorithms for given problems.	Understanding Level (C2)
C274.3	Apply Searching, Sorting, and Trees and use their properties for abstractions and defining modules for implementing functionalities.	Apply Level (C3)
C274.4	Examine case-study specific application of Heaps, Graphs, and Hashing methods.	Apply Level (C3)
C274.5	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.	C274.1
2.	Analysis of Algorithms	Introduction to problem solving approach; Growth of Functions; determine execution time	C274.2
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.	C274.1
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.	C274.3
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;	C274.4
6.	Algorithm Design Techniques:	Strassen's matrix multiplication; and Closest pair, etc.	C274.5

	Divide and Conquer, Greedy Algorithms, Backtracking Algorithms, Dynamic Programming.	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;	
7.	Project	Students are expected to design an application based by applying concepts of data structure and algorithms.	**C274.1, C274.2, C274.3, C274.4, C274.5**

Evaluation Criteria

Components	**Maximum Marks**
Lab Test-120	
Lab Test-2	20
Day-to-Day	60 (Attendance (10), Lab evaluations (35), Project (15))
Total	100

Project based learning: Each student will make an application by applying the concepts of data structure and algorithms (either single or in combination) covered as part of this course. Student will be required to develop a project by selecting appropriate algorithm for the application through analyzing the complexity of the algorithms. Building an application by choosing best data structure and algorithm reduces the space and time required to execute the application, while handling the various facets of data structure and algorithm will give students a hands on experience of working in the area of application development. The knowledge gained will enhance their employability in the IT sector.

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

Text Books

1.	Leiserson, Charles E.., Stein, Clifford., Rivest, Ronald L.., Cormen, Thomas H.. Introduction to Algorithms, Fourth Edition. United States: MIT Press, 2022.
2.	Anggoro, Wisnu. C++ Data Structures and Algorithms: Learn how to Write Efficient Code to Build Scalable and Robust Applications in C++. India: Packt Publishing, 2018.
3.	Carey, John., Doshi, Shreyans., Rajan, Payas. C++ Data Structures and Algorithm Design Principles: Leverage the Power of Modern C++ to Build Robust and Scalable Applications. United Kingdom: Packt Publishing, 2019.
4.	Drozdek, Adam. Data structures and algorithms in C++. United States: Cengage Learning, 2005.

Reference Books and Material

5.	Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983
6.	Weiss, Data Structures and Algorithm Analysis in C, Benjamin and Cummings Pub., 1994
7.	Fundamental of Data Structures in C++, Horobitz and Sahni and Mehta, 2009, Galgotia
8.	Theory and Problems of Data Structures with C++, Shaum's outline, McGraw-hill, 2000
9.	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978
10.	ACM Transactions on Algorithms (TALG), 2022

Course Code	18B15GE112	Semester: **ODD**	Semester: **III** Session**: 2022-23**
			Month from Aug-22 to Dec-22

Course Name	Workshop		

Credits	1.5	**Contact Hours**	03

Faculty (Names)	**Coordinator(s)**	Prabhakar Jha, Nitesh Kumar
	Teacher(s) (Alphabetically)	Chandan Kumar, Madhu Jhariya, Nitesh Kumar. Prabhakar Jha, and Rahul Kumar

COURSE OUTCOMES		COGNITIVE LEVELS
C179.1	Tell the basic of manufacturing environment and various safety measures associated with it.	Remembering Level (C1)
C179.2	Apply the appropriate tools to fabricate joints utilizing work-bench tools.	Applying Level (C3)
C179.3	Create various prototypes in the carpentry trade, fitting trade, and welding trade	Creating Level (C6)
C179.4	Demonstrate the working principle of lathe, shaper and milling machines and able to fabricate the prototypes of desired shape and accuracies.	Understanding Level(C2)

Module No.	Title of the Module	List of Experiments	CO
1.	Carpentry	Preparation of T joint as per the given specification. Preparation of dovetail joint/ cross lap joint as per given specification.	**C179.2, C179.3**
2.	Welding Shop	To study Gas welding and Arc welding equipment and various safety measures associated with it. To make butt joint and lap joint.	**C179.1**, **C179.2, C179.3**
3.	Sheet Metal Shop	To prepare a square tray using GI sheet. To prepare a funnel using GI sheet.	**C179.2, C179.3**
4.	Fitting Shop	To prepare V- groove fit as per given specifications. To prepare square fit as per given specifications.	**C179.2, C179.3**
5.	Machine Shop	To perform turning, facing and grooving operation on Lathe. To perform slotting operation on Shaper Machine. To perform face milling operation on Milling Machine.	**C179.4**

Evaluation Criteria

Components	Maximum Marks
Viva 1	20
Viva 2	20
Report file, Attendance, and D2D	60 [File Work (20) + Attendance (10) + (Experimental Work (30)]
Total	**100**

Project based learning: Here students are divided in groups and learn about the applying of appropriate tools to fabricate joints utilizing work-bench tools which helps them in creating various prototypes in the field of engineering and technology. In the present workshop laboratory with the application of the course outcomes, students prepare their projects like robotic car, cutting of electronic board made of wood, etc. where application of carpentry shop, sheet metal shop and fitting shop is required.

	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.	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai
2.	Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4th edition, Pearson Education India Edition, 2002.
3.	Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc GrawHill House, 2017.
4.	John K.C., Mechanical Workshop Practice, 2nd Edition, PHI, 2010
5.	Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998
6.	Gowri P.Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008
7.	Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	21B19CS211	Semester: **ODD**	Semester: **III** Session**: 2022-23**
			Month from **Aug-22 to Dec-22**

Subject Name	Programming Fundamentals		
Credits	1	**Contact Hours**	1-0-0

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

COURSE OUTCOMES		COGNITIVE LEVELS
C215.1	Explain various data types, constructs of conditional programming and programming by loops	Understand Level (Level 2)
C215.2	Explain need of array and structures	Understand Level (Level 2)
C215.3	Apply and implement functions with or without pointers for different problems	Apply Level (Level 3)
C215.4	Write programs in C++ to implement OOPs concepts related to objects, classes, constructor, destructor, and friend function.	Apply Level (Level 3)
C215.5	Write programs in C++ using OOPs concept like encapsulation, inheritance, polymorphism, abstraction, stacks, queues, searching and sorting.	Apply Level (Level 3)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures
1	C Programming Fundamentals	Datatypes, Conditional Statements: IF, IF-ELSE, ESLEIF, Switch-Case, Looping: FOR, WHILE, DO-WHILE.	2
2	Structures, Pointers & Arrays	Structure Definition, Structure Handling, Introduction to Pointers, Arrays.	2
3	C Programming Functions	Function Definition, Function Declaration, Call by Value, Call by Reference, Recursions.	1
4	Object Oriented Fundamentals using C++	Objects, Classes, Methods, implementing functions in the class, use of scope resolution operator, Access Modifiers, static functions and static data members, constructor and destructors,	2
5	OOP Advanced Concepts	Inheritance: single, multiple, multi-level and hybrid, Polymorphism: function and operator overloading, virtual member functions, abstract base classes and pure virtual functions, Introduction to SDLC.	3
6	Basic Data Structures	Stacks, Stack, Queue (array-based implementation). Circular Queue and Deque	2

	using C	using array, 1D-Linked list, 2D-Link list application, Binary trees, Binary tree Implementation: array and pointer based	
7	Searching & Sorting	Searching Techniques: Linear Search, Binary Search; Sorting: Bubble Sort, Insertion Sort, Selection Sort.	2
		Total number of Lactures	**14**

Evaluation Criteria

Components	Maximum Marks	
Test-1	20	
Test-2	20	
End Term	35	
TA	25	(Project, Assessment, Attendance)
Total	100	

Project based learning: Each student in a group of 2-3 will have to develop a project based on different real-world problems. Students have to study the C, C++ and Data Structures before finalizing the objectives. Project development will enhance the knowledge and employability of the students in IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1	Herbert Schildt. "The Complete Reference C++ ", 4th Edition, TMH, 2017
2	Yashavant P Kanetkar,"Let Us C" (2016). BPB Publications, 15th Edition.
3	Herbert Schildt. "The Complete Reference C ", 4th Edition, TMH, 2017
4	E Balaguruswamy , Object Oriented Programming With C++ , 7th Edition , TMH, 2017

Subject Code	21B19CS212	Semester: **ODD**	Semester: **III** Session**: 2022-23**
			Month from **Aug-22 to Dec-22**
Subject Name	Programming Fundamentals Lab		
Credits	1	**Contact Hours**	0-0-2

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

COURSE OUTCOMES		COGNITIVE LEVELS
C275.1	Explain various data types, constructs of conditional programming and programming by loops	Understand Level (Level 2)
C275.2	Explain need of array and structures	Understand Level (Level 2)
C275.3	Apply and implement functions with or without pointers for different problems	Apply Level (Level 3)
C275.4	Write programs in C++ to implement OOPs concepts related to objects, classes, constructor, destructor, and friend function.	Apply Level (Level 3)
C275.5	Write programs in C++ using OOPs concept like encapsulation, inheritance, polymorphism, abstraction, stacks, queues, searching and sorting.	Apply Level (Level 3)

Module No.	Subtitle of the Module	Topics in the module	No. of Lab sessions
1	C Programming Fundamentals	Practical Problems on Datatypes, Conditional Statements: IF, IF-ELSE, ESLEIF, Switch-Case, Looping: FOR, WHILE, DO-WHILE.	2
2	Structures, Pointers & Arrays	Practical Problems on Structure Definition, Structure Handling, Introduction to Pointers, Arrays.	2
3	C Programming Functions	Practical Problems on Function Definition, Function Declaration, Call by Value, Call by Reference, Recursions.	1
4	Object Oriented Fundamentals using C++	Practical Problems on Objects, Classes, Methods, implementing functions in the class, use of scope resolution operator, Access Modifiers, static functions and static data members, constructor and destructors,	2
5	OOP Advanced Concepts	Practical Problems on Inheritance: single, multiple, multi-level and hybrid, Polymorphism: function and operator overloading, virtual	3

		member functions, abstract base classes and pure virtual functions, Introduction to SDLC.	
6	Basic Data Structures using C	Practical Problems on Stacks, Stack, Queue (array-based implementation). Circular Queue and Deque using array, 1D-Linked list, 2D-Link list application, Binary trees, Binary tree Implementation: array and pointer based	2
7	Searching & Sorting	Practical Problems on Searching Techniques: Linear Search, Binary Search; Sorting: Bubble Sort, Insertion Sort, Selection Sort.	2
		Total number of Labs	**14**

Evaluation Criteria

Components	Maximum Marks
Mid Term Test-1	**20**
End Term Test-2	**20**
Day To Day	**60(Project, Assessment, Attendance)**
Total	**100**

Project based learning: Each student in a group of 2-3 will have to develop a project based on different real-world problems. Students have to study the C, C++ and Data Structures before finalizing the objectives. Project development will enhance the knowledge and employability of the students in IT sector.

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

1	Herbert Schildt. "The Complete Reference C++ ", 4th Edition, TMH, 2017
2	Yashavant P Kanetkar,"Let Us C" (2016). BPB Publications, 15th Edition.
3	Herbert Schildt. "The Complete Reference C ", 4th Edition, TMH, 2017
4	E Balaguruswamy , Object Oriented Programming With C++ , 7th Edition , TMH, 2017

Course Code	22B15HS211	Semester: ODD	Semester: III Session: 2022-23
			Month from Aug-22 to Dec-22
Course Name	Professional Communication Practice		
Credits	0	Contact Hours	0-0-2

Faculty (Names)	Coordinator(s)	Dr Anshu Banwari
		Dr Swati Sharma
	Teacher(s) (Alphabetically)	Dr Ankita Das, Dr Anshu Banwari, Dr Badri Baja, Dr Ekta Srivastava, Dr Debjani Sarkar, Dr.Deepak Verma, Dr Monali Bhattacharya, Dr Mukta Mani, Dr Priyanka Chhaparia, Dr Nilu Choudhary, Dr Shirin Alavi, Dr Swati Sharma

COURSE OUTCOMES		COGNITIVE LEVELS
C251.1	Explore one's strengths and frame professional goals	Analyze(C4)
C251.2	Apply workplace communication skills in a professional setting	Apply(C3)
C251.3	Develop their professional and social competence	Apply(C3)
C251.4	Demonstrate the ability to apply professional ethics in contemporary workplace settings	Understanding(C2)

Module No.	Title of the Module	Description of the module	List of Activities	Number of Labs
1.	Intrapersonal Communication	Self-exploration, Setting Personal, Professional Goals with Holistic Perspectives	Practical Sessions on a) Self Inventory, b) Goal Setting c) SWOC Analysis	3 labs
2	Interpersonal Communication	Extending Intrapersonal influence for enhancing social competence. Inculcating assertiveness, empathy, Inclusivity and win- win approach to communication.	Practice session through role-play on situation related to a) workplace conflict, b) business negotiation c) Gender sensitization	3 labs
3.	Professional Interaction and Etiquettes	Liaison harmoniously with audience, taking initiatives and team focus	Practical Session on mediated interpersonal communication a) Topical group discussion, b) case study group discussion c) Mock interviews)	4 labs
4.	Professional written communication	Enhancing professional competency through professional writing	Practical session on styles of workplace writing: a) E-mail, b) Report, c) Website and Resume writing	3 labs

5.	Professional Ethics	Enhancing Ethical Awareness	Case Study and oral discussion on ethical dilemmas	1 Lab
		Total number of Labs		**14**

Evaluation Criteria

Components	Maximum Marks
Lab test 1	**20 (Group Discussion)**
Lab Test 2	**20 (End Term Presentation)**
PBL	**30**
Assignment	**20**
Attendance	**10**
Total	**100**

Project-based learning: The students in groups of 4-5 will identify an organization of their choice and present a report (based on desk-based research) focusing on the skills, values and ethics promoted by the company. Based on the insight gained from the research each student is then required to pitch their candidature through a video CV.

Reference:

1	George Cheney, Daniel J. Lair, Dean Ritz and Brenden E. Kendall, Just a Job?: Communication, Ethics and Professional Life, Oxford University Press, USA, 2009.
2	Timothy S. Boswood, "Redefining the professional in International Professional Communication," in Exploring the Rhetoric of International Professional Communication, Carl R. Lovitt and Dixie Goswami, Ed. Routledge, 2020, pp. 111-136.
3	Steven A. Beebe and Timothy P. Mottet. Business and Professional Communication, Principles and Skills for Leadership, Pearson, 2013.
4	R. Almonte, A Practical Guide to Soft Skills: Communication, Psychology, and Ethics for Your Professional Life. Routledge, 2021.
5	K. M. Quintanilla &S. T. Wahl, Business and Professional Communication: Keys for Workplace Excellence. Sage Publications, 2020
6	K.Floyd& P. W, Cardon, Business and Professional Communication. McGraw-Hill Education,2020
7	P. Hartley & P. Chatterton, Business Communication: Rethinking your professional practice for the post-digital age. Routledge, 2015