Course Structure Detailed Syllabus

B. Tech

in

Computer Science and Engineering (CSE)

Birla School of Engineering and Technology

Birla Global University

Bhubaneswar

Contents

Vision

To be a leading school in computer science and engineering, fostering global knowledge, innovation, and ethical practices to address the challenges of a technology-driven world.

Mission

1. To cultivate technical excellence and innovation through an experiential learning environment, integrating real-world problem-solving to prepare students for global challenges.
2. To offer a flexible curriculum with diverse electives, empowering students to tailor their education and develop multidisciplinary competencies.
3. To nurture industry readiness by providing skill enhancement programs, technical training, and career support aligned with emerging trends in computer science and engineering.
4. To build industry-academia collaborations, exposing students to state-of-the-art practices, promoting sustainable innovation, and fostering a culture of inclusiveness and lifelong learning.

Objectives of the Program

The objective this program is to prepare students for a successful career in engineering, research, or academia. The program aims to develop students' problem-solving skills and prepare them for the needs of the industry.

1. **Comprehensive Technical Knowledge**
   To ensure students acquire a strong foundation in computer science concepts, theories, and applications, enabling them to solve complex technical problems effectively.

2. **Research and Innovation**

   To develop students' ability to conduct research, innovate, and adapt to rapidly evolving technologies, fostering a culture of inquiry and continuous improvement.

3. **Ethical and Professional Conduct**

   To instil professional ethics, integrity, and social responsibility, preparing students to make informed and ethical decisions in their professional careers.

4. **Lifelong Learning**

   To encourage a mind-set of lifelong learning and adaptability, equipping students to stay updated with the latest trends and advancements in computer science and engineering.

5. **Global and Cross-Disciplinary Competence**

   To prepare students to work effectively in diverse and interdisciplinary teams, ensuring they are capable of addressing global challenges with innovative solutions.

6. **Problem-Solving and Critical Thinking**
   To cultivate critical thinking and analytical skills for designing, implementing, and optimizing computing systems and applications to solve real-world problems.

7. **Leadership and Teamwork**

   To develop leadership qualities and the ability to work collaboratively, empowering students to lead and contribute to projects and initiatives in dynamic, global industries.

8. **Social Responsibility and Sustainability**
   To nurture awareness of societal and environmental needs, encouraging students to create solutions that contribute positively to sustainable development.

9. **Entrepreneurship and Industry Readiness**

   To equip students with entrepreneurial abilities and industry-relevant skills, preparing them for roles in start-ups, established organizations, and as innovators.

10. **Specialized Expertise**

    To provide opportunities for specialization in areas such as artificial intelligence, machine learning, cloud computing, data science, cybersecurity, and the Internet of Things, aligning with contemporary industry demands.

B.Tech in Computer Science & Engineering

The Bachelor of Technology (B.Tech) in Computer Science & Engineering is a four-year undergraduate program designed to provide students with a comprehensive understanding of computer science principles, software development, and modern technologies. The program emphasizes both theoretical foundations and practical skills to prepare students for successful careers in the rapidly evolving tech industry.

Throughout the course, students gain expertise in areas such as programming, algorithms, data structures, artificial intelligence, machine learning, cloud computing, cybersecurity, software engineering, and more. The curriculum is designed to align with industry needs, equipping students with the knowledge to tackle real-world challenges through innovative problem-solving and cutting-edge technological solutions.

In addition to technical proficiency, the program also focuses on developing essential skills such as critical thinking, teamwork, communication, and leadership. Students are encouraged to engage in research and innovation, fostering a mindset of lifelong learning and adaptability.

Graduates of the B.Tech in Computer Science & Engineering program are prepared for a wide range of career opportunities in software development, IT consulting, data science, cybersecurity, and beyond. The program also equips students with the entrepreneurial skills to pursue startups or contribute to interdisciplinary teams, making them highly adaptable in a fast-paced, global job market.

Overall, the B.Tech in Computer Science & Engineering program aims to produce well-rounded, ethically responsible professionals who are capable of contributing meaningfully to technological advancements and societal development

Outcome Based Approach to Education (OBE)

As per the National Higher Education Qualification Frameworks (NHEQF), students are expected to possess the quality & characteristics of the graduate of a Programme of the study, including learning outcomes relating to the disciplinary areas, learning generic outcomes that are expected to be acquired by a graduate on completion of the Programme.

OBE is an educational model that forms the base of a quality education system. There is no specified style of teaching or assessment in OBE. All educational activities carried out in OBE should help the students to achieve the set goals. The faculty may adapt the role of an instructor, trainer, facilitator, and/or mentor based on the outcomes targeted. OBE enhances the traditional methods and focuses on what the institute provides to the students. It shows the success by making or demonstrating outcomes using statements 'able to do' in favour of students. It provides clear standards for observable and measurable outcomes.

Graduate Attributes

The B.Tech in Computer Science & Engineering program is designed to develop the following key graduate attributes, ensuring that students are well-prepared for the demands of the industry and society. The B.Tech program is not only technically proficient but also capable of leading in the dynamic, fast-evolving tech industry while making a positive contribution to society with the following attributes -

1. **Technical Expertise**
   Graduates will have a strong understanding of computer science principles, algorithms, programming languages, and technologies, enabling them to develop, analyse, and optimize software and computing systems.

2. **Critical Thinking and Problem-Solving Skills**
   Graduates will possess the ability to apply logical reasoning and critical thinking to solve complex computational problems, both independently and in collaborative settings.

3. **Innovation and Research Orientation**

   Graduates will be equipped with skills to engage in research and innovation, using modern tools and technologies to create novel solutions and contribute to advancements in the field.

4. **Ethical and Social Responsibility**

   Graduates will demonstrate a high standard of professional ethics and responsibility, ensuring their work positively impacts society, respects cultural diversity, and adheres to legal and environmental standards.

5. **Leadership and Teamwork**

   Graduates will be able to work effectively in interdisciplinary teams and demonstrate leadership abilities, contributing to project planning, execution, and decision-making processes in dynamic and diverse environments.

6. **Adaptability and Lifelong Learning**

   Graduates will be equipped with the skills to adapt to rapidly evolving technologies, fostering a mind-set of lifelong learning to stay updated with industry trends and pursue continuous professional development.

7. **Communication and Interpersonal Skills**

   Graduates will possess strong communication skills, both written and oral, enabling them to effectively present technical concepts, collaborate with stakeholders, and articulate ideas to diverse audiences.

8. **Global Competence**

   Graduates will be prepared to work in a global context, understanding the implications of technology on international markets and collaborating across borders to develop solutions to global challenges.

9. **Entrepreneurial Mind-set**

   Graduates will have an entrepreneurial outlook, capable of identifying opportunities, innovating, and potentially launching their own ventures or contributing to the success of technology-driven businesses.

10. **Sustainability and Environmental Awareness**

    Graduates will understand the impact of technology on the environment and society, ensuring their solutions promote sustainability and align with global efforts towards social, economic, and environmental well-being.

Program Outcomes (POs)

PO1 Engineering Knowledge

Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.

PO2 Problem Analysis

Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3 Design/Development of Solutions

Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4 Conduct Investigations of Complex Problems

Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5 Engineering Tool Usage

Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6 The Engineer and The World

Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7 Ethics

Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8 Individual and Collaborative Team work

Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9 Communication

Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10 Project Management and Finance

Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11 Life-Long Learning

Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

Program Educational Objectives (PEOs)

PEO 1: Graduates will acquire a robust foundation in computer science, enabling them to apply theoretical and practical knowledge to design innovative solutions for real-world problems across diverse industries.

PEO 2: Graduates will demonstrate excellent communication skills, the ability to work collaboratively in multidisciplinary teams, and the adaptability to embrace emerging technologies and dynamic professional environments.

PEO 3: Graduates will exhibit a strong commitment to ethical practices, social responsibility, and sustainable development, contributing positively to society and fostering technological advancements for the greater good.

Program Specific Outcomes (PSOs)

PSO 1: Upon completion of the program, students will demonstrate proficiency in software development by designing, developing, and deploying scalable and reliable software solutions to address real-world problems and meet user requirements effectively.

PSO 2: Graduates will exhibit competence in data analysis and decision making by applying statistical methods, machine learning algorithms, and data visualization techniques to analyze large datasets, extract meaningful insights, and make informed decisions across various domains and industries.

PSO 3: Students will achieve mastery of emerging technologies by acquiring in-depth knowledge and practical experience in areas such as artificial intelligence, machine learning, cloud computing, cybersecurity, and mobile applications, enabling them to adapt to technological advancements and contribute innovatively to the digital transformation of organizations and society.

Credit Distribution and Course Types

Semester	HS	BS	ES	PC	PE	OE	PST	MC	
Sem I	6	4	8					1	19
Sem II	3	7	6	4					20
Sem III	1		4	15			1		21
Sem IV			4	14	3		1		22
Sem V	2			14	3		3	1	23
Sem VI			3	11	3	3	2	1	23
Sem VII	3			8	3	3	4		21
Sem VIII					6	3	6		15
Total Credit	15	11	25	65	15	12	17	3	164
Percentage of the Course	9.1%	6.7%	15.2%	40.2%	10.9%	5.4%	10.3%	1.8%	

HS – Human Science

BS – Basic Science

ES – Engineering Science

PC – Professional Core

PE – Professional Elective

OE – Open Elective

PST – Project/Seminar/Internship

MC – Mandatory Course

Syllabus Structure

B. Tech in Computer Science and Engineering

I Semester [First Year]						
SN	**CC**	**Name of the Subject**	**L**	**T**	**P**	**C**
THEORY						
1	ES	Programming for Problem Solving using C	3	0	0	3
2	BS	Engineering Mathematics-I	3	1	0	4
3	ES	Basic Electrical Engineering	3	0	0	3
4	HS	Universal Human Values	3	0	0	3
5	HS	Technical Communication	2	0	0	2
PRACTICAL/SESSIONAL						
6	MC	Sports/Yoga	0	0	1	1
7	ES	Problem Solving using C Lab	0	0	2	1
8	ES	Basic Electrical Engineering Lab	0	0	2	1
9	HS	Technical Communication Lab	0	0	2	1
		TOTAL	**19**			

II Semester [First Year]						
SN	**CC**	**Name of the Subject**	**L**	**T**	**P**	**C**
THEORY						
1	PC	Data Structures	3	0	0	3
2	BS	Engineering Mathematics-II	3	1	0	4
3	ES	Basic Electronics	3	0	0	3
4	BS	Engineering Physics	3	0	0	3
5	HS	Corporate Communications	2	0	0	2
6	ES	Design Thinking	2	0	0	2
PRACTICAL/SESSIONAL						
7	ES	Basic Electronics Laboratory	0	0	2	1
8	PC	Data Structure Laboratory	0	0	2	1
9	HS	Corporate Communication Lab	0	0	2	1
		TOTAL	**20**			

III Semester [Second Year]						
SN	**CC**	**Name of the Subject**	**L**	**T**	**P**	**C**
THEORY						
1	PC	Discrete Mathematics	3	1	0	4
2	PC	Database Management Systems	3	0	0	3
3	ES	Digital System Design	3	0	0	3
4	PC	Object-Oriented Programming through Java	3	0	0	3
5	PC	Computer Network	3	0	0	3
PRACTICAL/SESSIONAL						
6	ES	Digital System Design Lab	0	0	2	1
7	PC	Object-Oriented Programming through Java Lab	0	0	2	1
8	PC	Data Base Management Systems Lab	0	0	2	1
9	HS	Social Responsibly and Community Engagement/NSS	0	0	2	1
11	PST	Learning Project-I	0	0	0	1
		TOTAL	**21**			

IV Semester [Second Year]						
SN	**CC**	**Name of the Subject**	**L**	**T**	**P**	**C**
THEORY						
1	ES	Fundamentals of Python Programming	3	0	0	3
2	PC	Computer Organization & Architecture	3	0	0	3
3	PC	Design and Analysis of Algorithms	3	0	0	3
4	PC	Operating System	3	0	0	3
5	PE	Professional Elective-I(From Bucket)	3	0	0	3
6	PC	Artificial Intelligence	3	0	0	3
PRACTICAL/SESSIONAL						
7		Fundamentals of Python Programming Lab	0	0	2	1
8	PC	Design and Analysis of Algorithms Lab	0	0	2	1
9	PC	Unix and Shell Programming Laboratory	0	0	2	1
10	PST	Learning Project-II	0	0	0	1
		TOTAL	**22**			

V Semester [Third Year]						
SN	**CC**	**Name of the Subject**	**L**	**T**	**P**	**C**
THEORY						
1	HS	Engineering Economics and Costing	2	0	0	2
2	PC	Formal Language and Automata Theory	3	0	0	3
3	PC	Data Mining and Data Warehousing	3	0	0	3
4	PE	Professional Elective-II (From Bucket)	3	0	0	3
5	PC	Software Engineering	3	0	0	3
6	PC	Introduction to Cyber Security	3	0	0	3
PRACTICAL/SESSIONAL						
7	PC	Software Engineering Lab	0	0	2	1
8	PC	Data Mining Lab	0	0	2	1
9	PST	Minor Project -I	0	0	4	2
10	PST	Summer Internship-I	0	0	1	1
11	MC	Constitution of India	0	0	2	1
		TOTAL				**23**

VI Semester [Third Year]						
SN	**CC**	**Name of the Subject**	**L**	**T**	**P**	**C**
THEORY						
1	ES	Optimization Techniques	3	0	0	3
2	PC	Introduction to Machine Learning	3	0	0	3
3	PC	Microprocessors and Microcontroller	3	0	0	3
4	PE	Professional Elective-III (From Bucket)	3	0	0	3
5	PC	Cloud Computing	3	0	0	3
6	OE	Open Elective-I (From Bucket)	3	0	0	3
PRACTICAL/SESSIONAL						
7	PC	Cloud Computing Lab	0	0	2	1
8	PC	Machine Learning Lab	0	0	2	1
9	PST	Minor Project Work-II	0	0	4	2
10	MC	Essence of Indian Knowledge Tradition	0	0	2	1
		TOTAL	**23**			

VII Semester [Fourth Year]						
SN	**CC**	**Name of the Subject**	**L**	**T**	**P**	**C**
THEORY						
1	PC	Compiler Design	3	0	0	3
2	PC	Introduction to Internet of Things	3	0	0	3
3	PE	Professional Elective-IV (From Bucket)	3	0	0	3
4	HS	Entrepreneurship Development	3	0	0	3
5	OE	Open Elective-II (From Bucket)	3	0	0	3
PRACTICAL/SESSIONAL						
6	PC	Internet of Things Lab	0	0	2	1
7	PC	Compiler Design Lab	0	0	2	1
8	PST	Major Project Work-I	0	0	6	3
9	PST	Summer Industry Internship-II	0	0	0	1
		TOTAL	**15**	**0**	**8**	**21**

VIII Semester [Fourth Year]						
SN	**CC**	**Name of the Subject**	**L**	**T**	**P**	**C**
THEORY						
1	PE	Professional Elective-V (From Bucket)	3	0	0	3
2	PE	Professional Elective-VI (From Bucket)	3	0	0	3
3	OE	Open Elective-III (From Bucket)	3	0	0	3
PRACTICAL/SESSIONAL						
4	PST	Technical Seminar	0	0	0	1
5	PST	Major Project Work-II	0	0	8	4
6	PST	Comprehensive Viva-Voice	0	0	2	1
		TOTAL	**9**	**0**	**6**	**15**

Professional Electives Bucket	
PE I	Introduction to Data Science
	Introduction to Soft Computing
	Fuzzy Logic & Applications
	UI/UX Design
	Data Modelling
PE II	Data Preparation and Analysis
	Data Storage and Management in Cloud
	Cloud Security
	Wireless Sensor Network
	Introduction to Distributed System
	Computational Intelligence
PE III	Parallel Computing
	Digital Image Processing
	Big Data Analytics
	Business Intelligence and Analytics
	Serverless Computing
	Cryptography and Network security
PE IV	Natural Language Processing
	Pattern Recognition
	Computer Vision
	Health Care Data Analytics
	Information Retrieval System
	Mobile Computing
PE V	Block Chain Technology
	Edge Computing
	Robotics and Automation
	Bio-inspired Computing
	Cloud Dev-Ops
	Secure Cloud Architecture
PE VI	Intrusion Detection System
	Software Testing
	Real Time System
	Software Project Management
	Computer Graphics
	Generative AI

Open Electives Bucket	
OE I	Web Development with PHP
	Advanced Java
	Bioinformatics
	Introduction to Digital Signal Processing
	Genetic Algorithm
OE II	Android Application Development using Kotlin
	IOT Security and Privacy
	IOS Development
	Medical Image processing
	IOT Application Development
OE III	Data Analytics using R
	.NET programming
	Embedded System
	Genome Data Science
	Deep Learning

Detailed Syllabus

Programming for Problem Solving using C

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	I
Course Title	Programming for Problem Solving using C
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	ES
Course Objective	The subject aims to provide the student with: CO1. An understanding of basic concepts of computer programming. CO2. An introduction to the fundamentals of C language. CO3. An understanding of problem-solving programs.
Course Outcome (COs)	After completion of this course students will be able to: CO1. Memorize features of structure oriented programming and describe control statements, arrays, structures and pointers. CO2. Classify various types of statements and demonstrate programs on control structures, arrays, functions, pointers and structures. CO3. Solve problems using different programming logics and can able to discover better solutions. CO4. Analyse different programs by experimenting on them and estimating their efficiency. CO5. Evaluate complex programs by verifying their logics and justify their results.

Course Outline

Unit	Description	CO Mapping
UNIT1	**Introduction** Idea of Algorithm: Steps to solve logical and numerical problems. Representation of Algorithm: Algorithm /Flowcharts / Pseudocode, Generation of Programming Languages. Introduction to Language: Structure of C Program, Compiling and Executing C Code,	CO1

	Keywords, Identifiers, Primitive Data types in C, variables, constants, input/output statements in C. Operators and Expressions, Operator precedence and Associativity	
UNIT2	**Control Structure and Array** Conditional Branching/Selection Logic: if, if..else, else if ladder, nested if, switch..case. if, if else and else if ladder and switch, Iteration Logic: Loops - Iterative statements, nested loops, break and continue statements. Arrays & Strings: One-dimensional, Multi-dimensional arrays, operations on array, String Functions and operations.	CO2
UNIT3	**Function** Function: Declaration, Definition, Call and return, call by value, Call by reference, Scope of variables, Storage classes, Recursive functions, Recursion vs Iteration. Functions with array and string.	CO3
UNIT4	**User Defined Data Types: Structures** Declaration and initialization of structures, accessing structure elements, nested structures, structures and arrays, structures and functions, Structure vs Union, Pre-processor, typedef and Storage classes	CO4
UNIT5	**Pointers**: Idea of pointers, Defining pointers, Use of Pointers in matrices. Reading, writing and manipulating Strings, understanding computer memory, accessing via pointers, pointers to arrays, dynamic allocation, drawback of pointers. Dynamic memory allocation: Memory Layout, Implicit vs. Explicit Allocation; Static vs. Dynamic Allocation; Basics of File Handing	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

1. Forouzan, B. A., & Gilberg, R. F. (2007). A Structured Programming Approach Using C (3rd ed.). Cengage Publication.
2. Kernighan, B. W., & Ritchie, D. M. (2015). The C Programming Language (2nd ed.). Prentice Hall of India

Reference Books:

1. Gottfried, B. (2017). Schaum's Outline of Programming with C (3rd ed.). McGraw-HillBook.

Engineering Mathematics -I

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	I
Course Title	Engineering Mathematics -I
Course Code	
Credit	L-T-P- 3-1-0 Total Credit - 4
Course Type	ES
Course Objective	This course enables the students to understand 1. Infinite sequence of series 2. Theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc. 3.multivariable functions, their limits, continuity, partial differentiation, properties and applications of partial derivatives. 4. Integrals of multivariable functions viz. Double and triple integrals with their applications 5. Properties like gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions
Course Outcome (COs)	After the completion of this course, students will be able to CO1. decide the behaviour of sequences and series using appropriate tests. CO2. get an understanding of partial derivatives and their applications in finding maxima - minima problems. CO3. apply the principles of integral to solve a variety of practical problems in engineering and sciences CO4. demonstrate a depth of understanding in advanced mathematical topics CO5. Eenhance and develop the ability of using the language of mathematics in engineering.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Sequences and Series:** Infinite Sequences, Monotonic Sequences, Bounded Sequences, Convergence of Sequences, Cauchy's General Principle of Convergence. Infinite series, Convergence of Infinite Series, Tests for Convergence: Comparison tests, Ratio test, Cauchy's root test, Raabe's test,	CO1

	Logarithmic Test, Gauss test, Cauchy's Integral test, Alternating series, Leibnitz test.	
UNIT 2	Matrices, Special Matrices (Symmetric, Skew - Symmetric, Orthogonal Matrix, Unitary Matrix), Elementary Transformations, Rank of a Matrix, Row - reduced Echelon form, Normal From, Vectors, Linear Independence and Dependence of Vectors, System of linear equations, Introduction to Linear Transformations, Eigenvalues, Eigenvectors, Cayley - Hamilton theorem.	CO2
UNIT 3	Multivariable Differential Calculus Function of several variables, Limit, Continuity, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Chain rules, Jacobians and its properties, Taylor series for function of two variables, Maxima – Minima, Lagrange's method of multipliers.	CO3
UNIT 4	Multivariable Integral Calculus Double integrals, double integrals in polar coordinates, Change of order of integration, Triple Integrals, cylindrical and spherical coordinate systems, transformation of coordinates, Applications of double and triple integrals in areas and volumes. Beta and gamma functions.	CO4
UNIT 5	Vector Calculus Scalar and vector point functions, gradient, directional derivative, divergence, curl, vector equations and identities. Line Integral, Work done, Conservative field, Green's theorem in a plane, Surface and volume integrals, Gauss – divergence theorem, Stoke's theorem.	CO5

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. H. Anton, I. Brivens and S. Davis, Calculus, 10th Edition, John Wiley and sons, Singapore Pte. Ltd., 2013.

3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010. 19

Reference Books:

1. M. J. Strauss, G. L. Bradley And K. J. Smith, Calculus, 3rd Ed, Dorling.Kindersley (India) Pvt. Ltd. (P Ed), Delhi, 2007.
2. M. D. Weir, J. Hass and F. R. Giordano: Thomas' Calculus, 11th edition, Pearson Educations, 2008.
3. S.C. Malik and S. Arora, Mathematical Analysis, New Age International, 1992.
4. David C. Lay, Linear Algebra and its Applications (3rd Edition), Pearson Ed. Asia, Indian Reprint, 2007. 5. D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, Fourth Edition, 2011.

Basic Electrical Engineering

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	I
Course Title	Basic Electrical Engineering
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	ES
Course Objective	This course envisions to impart to students to: 1. Classify different electrical circuit elements and apply suitable laws and theorems for the analysis of electrical systems. 2. Represent series / parallel electric / magnetic circuits; 3. Employ three phase circuits for transfer of electrical power both under balanced and unbalanced condition. 4. Interpret the system responses under different operating conditions such as resonance, mutual coupling and star-delta conversion. 5. Assess the working of different A.C. electrical machines
Course Outcome (COs)	After the completion of this course, students will be able to CO1. Solve electrical circuits using Kirchhoff's laws and apply concepts of magnetic circuits in electrical systems. CO2. Analyse A.C. electrical circuits having dependent and independent sources for computation of responses such as voltage, current, power. CO3. Evaluate the advantages of 3 phase system in electrical industrial applications and differentiate between balanced and unbalanced operation. CO4. Assess the applicability of circuit theorems for practical applications. CO5. Integrate the sources of energy for transferring power to the consumers.

Course Outline

Unit	Description	CO Mapping
UNIT 1	Introduction: Importance of Electrical Engineering in day-to-day life, Electrical elements, properties and their classification, Ideal and Real Sources, Source Conversion D.C. Circuits: KCL and KVL, Loop current and Nodal voltage method Steady state analysis with independent and dependent sources; Star-Delta conversion. Magnetic Circuits: Introduction, Series-parallel magnetic circuits, Analysis of Linear and Nonlinear magnetic circuits, Energy storage, A.C. excitation, Eddy currents and Hysteresis losses.	CO1
UNIT 2	Single-phase AC Circuits: Series Circuits: Common signals and their waveforms, RMS and Average value, Form factor & Peak factor of sinusoidal waveform, Impedance of Series circuits. Phasor diagram, Active Power, Power factor. Power triangle. Parallel Circuits: Admittance method, Phasor diagram. Power, Power factor. Power triangle, Series- parallel Circuit, Power factor improvement, Series and Parallel Resonance: Resonance curve, Q–factor, Dynamic Impedance and Bandwidth.	CO2
UNIT 3	Three-Phase Circuits: Line and Phase relation for Star and Delta connection, Power relations, Analysis of balanced and unbalanced 3 phase circuits, Measurement of Power.	CO3
UNIT 4	Circuit Theorems: Superposition theorem, Thevenin's & Norton's Theorem, Maximum Power Transfer theorem for Independent and Dependent Sources for DC and AC circuits. Coupled Circuits (Dot rule), Self and mutual inductances, Coefficient of coupling.	CO4
UNIT 5	Working principles of AC Generators, motors and transformers, working principles of measuring equipments such as digital voltmeter, ammeter, power factor meter and wattmeter.	CO5

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text books:

1. Hughes Electrical Technology, Pearson, 10th edition, 2011.

2. Fitzgerald and Higginbotham, Basic Electrical Engineering, McGraw Hill Inc, 1981.

3. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering, 3rd Edition, TMH, 2009.

Reference books:

1. W. H. Hayt, Jr J. E. Kemmerly and S. M. Durbin, Engineering Circuit Analysis, 7th Edn TMH, 2010.
2. Electrical Engineering Fundamental, Vincent Del Toro, Prentice Hall, New Delhi.

Universal Human Values

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	I
Course Title	Universal Human Values
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	HS
Course Objective	This course envisions to impart to students to: 1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education. 2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession. 3. To help students understand the meaning of happiness and prosperity for a human being. 4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly. 5. To facilitate the students in applying the understanding of harmony in existence in them profession and lead an ethical life.
Course Outcome (COs)	After the completion of this course, students will be able to CO1. Understand the significance of value inputs in a classroom, distinguish between values and skills, CO2. Understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society

	CO3. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body. CO4. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious Society CO5. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature. CO6. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Course Outline

Unit	Description	CO Mapping
UNIT 1	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	CO1
UNIT 2	Understanding Harmony in the Human Being – Harmony in Myself Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.	CO2

UNIT 3	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family- the basic unit of human interaction, understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in societyUndivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!	CO3
UNIT 4	Understanding Harmony in the Nature and Existence – Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	CO4
UNIT 5	Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco- friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order:	CO5

	a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

References Books:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

Technical Communication

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	I
Course Title	Technical Communication
Course Code	
Credit	L-T-P- 2-0-0 Total Credit - 2
Course Type	HS
Course Objective	1. To expose the students with communicative English as a tool for making professional career. 2. To expose the students with various skills sets by sensitizing them to the dynamics of body language.
Course Outcome (COs)	After completion of this course students will be able to: CO1. Acquire correct usage of communicative English through vocabulary building, grammar and pronunciation. CO2. Improve good listening skills.

	CO3. Learning the phonetic alphabet CO4. Strengthen ability to be creative in written communication. CO5. Increase reading speed and comprehension

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Remedial Grammar** Identifying and rectifying common errors: Subject-verb agreement, Parts of Speech, Word choice, Vocabulary Building	CO1
UNIT 2	**Listening Skills** Listening Skills: Importance and types of Listening; The sounds of English, The International	CO2
UNIT 3	Phonetic Alphabet (IPA); Vowels, diphthongs, consonants, consonant clusters; phonemic transcription; Syllable division and word stress; sentence rhythm and weak forms, contrastive stress Intonation: falling, rising and falling-rising tunes	CO3
UNIT 4	**Reading and Writing Skills** Reading Comprehension, Types of Reading; Paragraph writing, Letter writing, Descriptive and Concise Writing.	CO4
UNIT 5	**Speaking Skills** Situational Speaking, Planning, Preparing, Organizing, Rehearsing, and Delivering Oral presentations, Power Point Presentation, Group Discussion; Public Speaking	CO5

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text Books:

1. Murphy, R. (2017). English Grammar in Use (4th ed.). Cambridge UP.
2. Balasubramanian, T. (2017). A Textbook of English Phonetics for Indian Students. [Publisher].

Reference Books:

1. Kumar, S., & Lata, P. (2015). Communication Skills (2nd ed.). Oxford University Press.

PRACTICAL/SESSIONAL

Problem Solving using C Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	I
Course Title	Problem Solving using C Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	ES
Course Objective	1. To develop programs for problems on different applications of array, functions, pointers and structure. 2. To analyse different problems by comparing and implementing in programming.
Course Outcome (COs)	After completion of this course students will be able to: CO1. Memorize features of structure oriented programming and describe control statements, arrays, structures and pointers. CO2. Classify various types of statements and demonstrate programs on control structures, arrays, functions, pointers and structures. CO3. Solve problems using different programming logics and can able to discover better solutions. CO4. Analyse different programs by experimenting on them and estimating their efficiency. CO5. Evaluate complex programs by verifying their logics and justify their results. CO6. Develop applications and projects using various features of structure oriented programming.

Lab Experiment 1: Familiarization with programming environment 1) Introduction to OS: Before starting experiments explain the facilities and operations of OS. 2) Introduction to the C compiler, Compilation and Execution Process & writing simple programs.
Lab Experiment 2: Simple computational problems using arithmetic expressions. 1) Write a program to input radius of a circle and Find the area, perimeter of it. 2) Write a program to input two numbers and swap them using an intermediate variable. 3) Write a program to input two float values and find their sum

4) Write a program to input 2 sides i.e: length and breadth of a rectangle. Find the area and perimeter of it.

Lab Experiment 3: Simple computational problems using arithmetic expressions.

1) Write a program to accept Fahrenheit and calculate its equivalent Celsius.

2) Write a program to input three unequal numbers and find the greatest using conditional operator.

3) write a program to find simple interest when principle amount, no. of terms and rate of interest given.

[Given formula: si=(p*t*r)/100]

4) write a program to find the area of a triangle when the 3 sides of it given as input.

[Given formula: s=(a+b+c)/2 and area= sqrt(s*(s-a)*(s-b)*(s-c))]

Lab Experiment 4: Simple computational problems using arithmetic expressions.

1) Write a program to input three unequal integers and find the largest number using conditional operator.

2) Apply Pythagorean theorem for finding the distance between two points i.e. side 'a' when the two sides namely 'b', 'c' are given as input. [Given formula is $a=sqrt(b^2+c^2)$]

3) John, Ram and shah were fishing in a river bank. Input the no. of fishes caught by each person and display who have caught more fishes (use conditional operator).

4) A boy is running in a circular playground having radius R given input. What will be the distance and displacement from one end to other end of ground? [Formula distance=Pi*R and Displacement=2*R]

Lab Experiment 5: Problems involving using if statement

1) In your garden two flower plants of rose and lily are growing. Input the growth of each plant in centimetres. Display the plant whose height is more. (use if..else)

2) In a software company a project team of 3 members namely manvi, shyam and William. Input their job experience in no. of years. The team lead must have more experience. Display who can be team lead. (use if..else)

3) Write a program to input 3 co-efficient values and find the real roots of quadratic equation.

4) Write a program input a digit within 0 to o6. Display week day example: 0 for Sunday, 1 for Monday etc (use else if ladder).

Lab Experiment 6: Problems involving using switch..case

1) Write a program to input a lower case alphabet and test whether it is vowel or consonant.(using else..if and switch both)

2) Write a program to input an arithmetic operator and two operands. Calculate and display the result as per the given operator using switch..case.

3) Write a program to find the greatest among three numbers.(using else..if and switch both)

Lab Experiment 7: Programming with while loop and do..while loop:

1) Write a program to input a number and test whether it is prime number or not using while statement.

2) Write a program to test a number is perfect or not using while statement.

(ex: The perfect number is 6, which is the sum of 1, 2, and 3. Other perfect numbers are 28, 496, and 8,128.)

3) Write a program to input a positive number and test whether it is palindrome or not using do..while statement.

4) Write a program to accept a positive integer and test it for Armstrong or not using do..while statement.

Lab Experiment 8: Programming with For loops and nested Loop:

1) The length of two rods are given as input in meters. The rods are to be cut into pieces of equal length. Find the maximum length of each piece. (use for loop)

2) Write a program to generate a series of Fibonacci numbers using for statement

3) Write a program to calculate the following sum using nested for statement:

Sum = $1-(x^2)/2! +(x^4)/4! – (x^6)/6! + (x^8)/8! – (x^{10})/10!....(x^n/n!)$

4) Write a program to generate the following pyramid using nested for statement:

```
        1
      1 2 1
    1 2 3 2 1
  1 2 3 4 3 2 1
```

Lab Experiment 9: Programming with 1D Array and 2D Array

1) Write a program to accept 10 integers in to an array and find largest and smallest integers present in them.

2) Write a program to input 10 numbers into an array. Find how many prime numbers exist in the array.

3) Write a program to input values into a square matrix of size 3X3. Display the transpose of the matrix.

4) Write a program to input elements into two matrices A[3][4], B[4][3]. Multiply A and B store result into matrix C[3][3]. Display the resultant matrix C.

Lab Experiment 10: Programming with Strings Handling Operations

1) Write a program to input a string and find the frequency of a given character in it.

2) Write a program to input two strings and compare them for equality without using library function.

3) Write a program to input a string and test it for palindrome or not using library functions.

Lab Experiment 11: Programming with User Defined Functions

1) Write a C program which contains three UDF's namely add(), subtract() and multiply(). Each function accepts two integers as their arguments and calculate and return the results.

2) Write a program to create an UDF and test a number is prime or not.

3) Write a program to create an UDF which accepts an array of 10 integers and find the largest element and smallest element present in the array.

Lab Experiment 12: Programming with Recursive Functions

1) Write a program to find the factorial of a number using recursive function.

2) Write a program to accept 10 elements into an integer array. Find the largest element present using recursive function.

3) Write a program to generate Fibonacci series using a recursive function.

Lab Experiment 13: Programming with Pointers

1) Write a program to swap two numbers using User Defined Function by applying call by address concept.

2) Write a program to perform matrix addition. Create an UDF which accepts the two matrices using two pointers and performs matrix addition.
3) Write a program to store N integer values using dynamic memory allocation. Then find the largest, smallest present in it using User Defined Function.
4) Write a program to store N integers using dynamic memory allocation. Find the average value of the integers using a user defined function.

Lab Experiment 14: Programming with Structures

1) Write a program create a structure PRODUCT having members Product no, Name and Price. Using a pointer Input 5 product details into a structure array and then display those products whose price is >1000 rupees.
2) Write a program to store 11 cricket players' details into an array of structure. The structure having member's player name, team name and batting average. Displays the name of players whose batting average is >=30.
3) Write a program to create a structure EMPLOYEE to store N employee details using DMA having members: employee no, name, salary. Create a function which displays only those employee names whose salary>=50000.
4) Write a program to create a structure for store library books using a structure having members book no, name, author, price. Store N books details using dynamic memory allocation. Create an UDF which accepts these books details using pointer and then display only those books whose cost>=1000.

Topic Beyond Syllabus

1) Write a program to input a set of numbers into a file called NUM.TXT. Display only the even numbers present in the file and also display their sum.
2) Write a program to store a paragraph into a file A.TXT using command line arguments and then create a copy of it with name B.TXT. =

Teaching Methods: Chalk& Board/ PPT/Video Lecture

- A case study can be given to each student for each UNIT.
- A Mini Project can be given which the student has to complete during the semester break.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th edition, Tata McGraw-Hill
2. Let us 'C' by Yashwant Kanethekar, 16th edition, BPB Publications

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,2nd edition, Prentice Hall of India
2. Programming in C, by Reema Thareja, 2nd edition, OUP India
3. C Programming and Coding by swati saxena, BPB Publications

Basic Electrical Engineering Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	I
Course Title	Basic Electrical Engineering Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	ES
Course Objective	1. To demonstrate the various theorem and power transform 2. To explain PN junction characteristics and its applications. 3. To understand the frequency response of BJT amplifier and OPAMP. 4. To Realize logic gates and implement simple Boolean expression. 5. To explain the Amplitude Modulation and Frequency Modulation
Course Outcome (COs)	After completion of this course students will be able to: CO1: Explain the concept of circuit laws and network theorems and apply them to laboratory measurements. CO2: Be able to systematically obtain the equations that characterize the performance of an electric circuit as well as solving both single phase and DC Machines CO3: Acknowledge the principles of operation and the main features of electric machines and their applications. CO4: Acquire skills in using electrical measuring devices. CO5: Understand the wiring methods, electricity billing, and working principles of circuit protective devices and personal safety measures

Course Outline

Unit	Description
Lab 1	Explanation and Verification of Thevenin's Theorem.
Lab 2	Experiment to Verify Superposition Theorem.
Lab 3	Verification of Maximum Power Transfer Theorem.
Lab 4	To study V-I characteristics of diode.
Lab 5	To study the input & output characteristics of BJT in CE configuration.

Lab 6	To study the full wave rectifier circuit with &without filter and determine the ripple factor.
Lab 7	To study the phenomenon of resonance in series RLC circuit.
Lab 8	Determination of losses in single phase transformer by OCT and SCT.
Lab 9	To calibrate a single phase induction type energy meter.
Lab 10	To study the running and reversing of a three phase SCIM.
Lab 11	Study of OP Amp based inverting and non-inverting amplifier.

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text Books:

1. Millman J., Halkias C.C., Parikh Chetan, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw-Hill, 2/e.
2. Mano M.M., "Digital Logic and Computer Design", Pearson Education, Inc, Thirteenth Impression, 2011.
3. Singal T. L., "Analog and Digital Communications", Tata McGraw-Hill, 2/e.
4. Haykin S., Moher M., "Introduction to Analog & Digital Communications", Wiley India Pvt. Ltd., 2/e.

Reference Book:

1. Boylstead R.L., Nashelsky L., "Electronic Devices and Circuit Theory", Pearson Education, Inc, 10/e.

Technical Communication Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	I
Course Title	Technical Communication Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	HS
Course Objective	6. To expose the students with communicative English as a tool for making professional career. 7. To expose the students with various skills sets by sensitizing them to the dynamics of body language.

Course Outcome (COs)	After completion of this course students will be able to: CO1. Acquire correct usage of communicative English through vocabulary building, grammar and pronunciation. CO2. Improve good listening skills. CO3. Learning the phonetic alphabet CO4. Strengthen ability to be creative in written communication. CO5. Increase reading speed and comprehension

Course Outline

Unit	Description
Lab 1	**Cover Letter Writing** •Introduction to the importance of cover letters in job applications. •Components of a cover letter: introduction, body, conclusion. •Analysing sample cover letters. •Interactive session: students draft their cover letters. •Peer review and feedback.
Lab 2	**CV/Resume Building** • Understanding the purpose and structure of a CV/resume. • Crafting impactful CV/resume content: education, work experience, skills, achievements. • Design and formatting tips. • Hands-on activity: students create their CVs/resumes using templates or online tools.
Lab 3	**Group Discussion Skills** •Importance of group discussions in the selection process. •Strategies for effective participation: active listening, articulation, persuasion. •Handling different types of GD topics: abstract, case-based, and opinion-based. •Conducting mock group discussions. •Peer evaluation and feedback on performance.
Lab 4	**Verbal Ability Enhancement** •Vocabulary-building exercises: synonyms, antonyms, word roots. •Grammar and sentence structure practice. •Interactive games and quizzes to reinforce verbal ability concepts
Lab 5	**Verbal Ability Enhancement (CONT...)** •Vocabulary-building exercises: synonyms, antonyms, word roots. •Grammar and sentence structure practice.

	• Interactive games and quizzes to reinforce verbal ability concepts
Lab 6	**Mock Interview Preparation (Part 1)** • Types of interviews: behavioral, competency-based, situational. • Understanding common interview questions and how to answer them. • Conducting practice interviews • Feedback on interview performance and areas for improvement.
Lab 7	**Integration and Practice** • Integrating cover letter writing, CV/resume building, group discussion, mock interview, and verbal ability skills. • Practical exercises combining multiple skills: e.g., conducting a mock interview based on a job posting, followed by group discussion and feedback. • Individualized coaching sessions for refining specific skills. • Final review and assessment of progress made throughout the lab.
Lab 8	**Review and Wrap-Up** • Recap of key learnings and skills acquired. • Opportunities for additional practice and skill development. • Q&A session to address any remaining doubts or questions. • Distribution of certificates of completion. • Encouragement for ongoing self-improvement and professional development.

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text Books:

3. Murphy, R. (2017). English Grammar in Use (4th ed.). Cambridge UP.
4. Balasubramanian, T. (2017). A Textbook of English Phonetics for Indian Students. [Publisher].

Reference Books:

2. Kumar, S., & Lata, P. (2015). Communication Skills (2nd ed.). Oxford University Press.

II Semester

THEORY

Data Structures

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Data Structures
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	PC
Course Objective	This course enables the students to understand 1. Develop algorithms for performing different operations on arrays, stack, Queue, linked list. Analyze the difference between them and understand different applications. Understand different searching and sorting methods and applications. 2. Understand and analyze Binary search Tree, AVL Tree, Heap Tree and their applications. Understand the memory representation of graph, its traversal methods and applications. Analyze the Hashing techniques in compare with other sorting techniques.
Course Outcome (COs)	After the completion of this course, students will be able to CO1. Understand the basic concepts of data structures, remember the fundamental concepts. CO2. Understand the methods by comparing the different data structures concepts. CO3. Develop algorithms for implementing different operations on data structures. CO4. Analyses of the algorithms regarding different operations on data structures. CO5. Solve and evaluate complex problems by coding on linear and non-linear data structures. CO6. Design algorithms on advanced concepts of data structure by implementation in different application of data structure.

Course Outline

Unit	Description	CO Mapping
UNIT 1	Basic concepts: Abstract Data Type, Data structures and types. Algorithm specification, 1D array: operations, 2D array: row major order and column major order, sparse matrix Searching: Linear search and Binary search on elements in a linear array. Sorting: Bubble sort, Insertion sort, Selection sort, quick sort, radix sort using linear array.	CO1
UNIT 2	Stack: Basic concepts, operations and implementation of stack using arrays, Mathematical procedure for conversions of arithmetic expressions. Applications of stack: infix to postfix conversion and postfix evaluation. Queue: Linear queue, operations and implementation using arrays, circular queue and its operations, Basics concepts of Double ended Queue and priority queue	CO2
UNIT 3	Linked Lists: The concepts and operations: insertion of a node (at the beginning, at the end, at location), deletion of a node (from the beginning, from the end, from a specific location), searching for a node in single linked list, circular single linked list and Double linked list. Implementation of stack and queue using single linked list. Basic concept of Circular double linked list.	CO3
UNIT 4	Trees: Introduction and Terminology, Binary Trees: Memory Representation of Binary Trees, Traversal, Construction, Expression Tree and its construction of using stack. Binary Search Trees: Algorithm for construction, searching, insertion and deletion operation, Height Balanced trees: Balance factor and its construction Heaps: Introduction to binary heaps, Max-heap, Min-heap, Creating Heap and using it for heap Sort.	CO4
UNIT 5	Graphs: Terminologies, Graph Memory representation - Adjacency matrix, Incidence Matrix, Linked Representation, path matrix, Warshall's Algorithm to find path matrix, Graph Traversals (BFS & DFS), Topological Sorting. Hashing: Hashing Functions: Division, Mid-square, Folding methods. Collision, linear probing, chaining	CO5

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text Books:

1. "Fundamental of Data Structure" (Schaums Series) Tata-McGraw-Hill.

2. Pai: "Data Structures & Algorithms; Concepts, Techniques & Algorithms "Tata McGraw Hill.

3. Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson publication

Reference Books:

1. "Fundamentals of data structure in C" Horowitz, Sahani & Freed, Computer Science Press.

2. "Data Structures and algorithms" by Narasimha Karumanchi, CareerMonk Publications

3. "Data structures through C in depth" by S.K.Srivastava, BPB Publications

Engineering Mathematics -II

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Engineering Mathematics -II
Course Code	
Credit	L-T-P- 3-1-0 Total Credit - 4
Course Type	BS
Course Objective	This course enables the students to understand 1. Various methods to solve linear differential equations of second and higher order 2. Various methods to solve linear differential equations of second and higher order special functions viz. Legendre's and bessel's and different properties associated with them 3. Diverse mathematical techniques for solving partial differential equations of first order and higher order, along with their applications in wave and heat equations using fourier series 4. 5the theory of functions of a complex variable, complex differentiation and integration 5. Infinite series (taylor and laurent series) for complex variable function, the theory of residues with applications to evaluation of integrals

Course Outcome (COs)	After the completion of this course, students will be able to CO7. Investigate the occurrence of differential equations in science and engineering and the methods available for their solutions. CO8. Formulate any real life problem in terms of differential equations. CO9. Gain an understanding on complex variable function, analytic functions and their properties using different theorems. CO10. Demonstrate a depth of understanding in advanced mathematical topics CO11. Enhance and develop the ability of using the language of mathematics in engineering

Course Outline

Unit	Description	CO Mapping
UNIT 1	Ordinary Differential Equations – I: Linear differential equations, Wronskian, Linear independence and dependence of solutions, Linear differential equations of second and higher order, Operator method, Euler – Cauchy's differential equation, Legendre's linear differential equation, Method of variation of parameters, Method of change of independent variable, Normal form method.	CO1
UNIT 2	Ordinary Differential Equations – II operation Power series, ordinary and singular points of differential equation, Power and Frobenius series solutions. Bessel's differential equation and its series solution, Bessel function of first kind and its properties. Legendre's differential equation and its series solution, Legendre's polynomial and its press	CO2
UNIT 3	Partial Differential Equations Fourier series, Euler formulae for Fourier series for length of interval, Dirichlet conditions, Fourier series for arbitrary length of interval, Half range Fourier series. Linear and quasi – linear partial differential equations, Lagrange's method, Linear – partial differential equations with constant coefficients, Method of separation of variables and its application in solving one dimensional wave and heat equations.	CO3
UNIT 4	Complex Variable Function of a complex variable, Limit, Continuity, Differentiability, Analyticity, Analytic functions, Cauchy – Riemann equations (Cartesian and Polar form), Harmonic functions, Complex Integration, Cauchy's theorem, Cauchy's Integral formula, Taylor and Laurent series for	CO4

	complex variable functions, Residues, Residue theorem and its applications in evaluation of real integrals.	
UNIT 5	Probability and Statisctics Definition and scope of statistics, average and dispersion, skewness and kurtosis, graphical statistics, classical and empirical definitions of probability, addition theorem, Conditional probability, multiplication theorem, independent events, Bayes' theorem, discrete and continuous random variables, cumulative distribution function, probability mass and density functions, mathematical expectation, variance, moment generating function.	CO5

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

3. D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, Fourth Edition, 2011.

4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004. 22

5. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing, Third Edition, 2009

6. R. A . Johnson, I. Miller and J. Freund: Probability and Statistics for Engineers, PHI

7. S. C. Gupta and V.K . Kapoor.: Fundamental of Mathematical Statistics, Sultan Chand and Sons

Reference Books:

1. M. J. Strauss, G. L. Bradley And K. J. Smith, Calculus, 3rd Ed, Dorling.Kindersley (India) 1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition ., Wiley India, 2009.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

4. G. F. Simmons, Differential Equations with Applications and Historical Notes, TMH, 2nd ed., 2003.
5. J. E. Freund: Mathematical Statistics, Pearson 6. P. L. Meyer: Introductory Probability and Statistical Applications, Oxford & IBH.

Basic Electronics

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Basic Electronics
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	ES
Course Objective	This course enables the students to understand 1. To understand PN Junction, diodes and their applications. 2. To comprehend BJT, FET and their bias configurations. 3. To grasp importance of feedback in amplifier circuits, op amp and its applications. 4. To understand number system, Logic Gates and Boolean algebra. 5. To apprehend fundamentals of communication technology.
Course Outcome (COs)	CO1. Explain PN Junction, diodes and their applications. CO2. Appraise the BJT, FET and their biasing techniques. CO3. Comprehend feedback in amplifier circuits, op amp and its applications. CO4. Translate one number system into another, build circuits with Logic Gates, electronic components and OPAMP IC 741 and analyze the measurement results using CRO. CO5. Appraise the fundamentals of communication technology.

Course Outline

Unit	**Description**	**CO Mapping**

UNIT 1	Diodes and Applications: Introduction to PN junction diodes; Characteristics of semiconductor diodes: V-I characteristics, diode-resistance, temperature-dependence, diode-capacitance; DC & AC load lines; Breakdown Mechanisms; Zener Diode – Operation and Applications; Diode as a Rectifier: Half Wave and Full Wave Rectifiers with and without C-Filters.	CO1
UNIT 2	Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Input and Output Characteristics of CB, CE and CC Configurations, dc and ac load line analysis, operating point, Transistor biasing: Fixed bias, emitter bias/self-bias, Low-frequency response of CE amplifier. Field Effect Transistors: JFET, Idea of Channel Formation, Pinch-Off and saturation Voltage, Current-Voltage Output Characteristics; MOSFET: Basic structure, operation and characteristics.	CO2
UNIT 3	Sinusoidal Oscillators: Concept of positive and negative feedback, Barkhausen criterion for sustained oscillations, Determination of Frequency and Condition of oscillation, Hartley and Colpitt's oscillator Operational Amplifiers: Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Inverting and non-inverting amplifiers, Offset error voltages and currents; Power supply rejection ratio, Slew Rate and concept of Virtual Ground, Summing and Difference Amplifiers, Differentiator and Integrator, RC phase shift oscillator.	CO3
UNIT 4	Logic Gates and Boolean algebra: Introduction to Boolean Algebra and Boolean operators, Symbolic representation, Boolean algebraic function and Truth table of different Digital logic Gates (AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR); Realization of Basic logic gates using universal gates, Adder, Subtractor, adder/subtractor.	CO4
UNIT 5	Electronic communication: Introduction to electronic communication system, Electromagnetic Communication spectrum band and applications, Elements of Electronic Communication System; Merits and demerits of analog and digital communication, Modes of communication; Signal radiation and propagation; Need for modulation; Introduction to Amplitude modulation and Angle modulation.	CO5

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

1. Millman J., Halkias C.C., Parikh Chetan, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw-Hill, 2/e.

2. Mano M.M., "Digital Logic and Computer Design", Pearson Education, Inc, Thirteenth Impression, 2011.

3. Singal T. L., "Analog and Digital Communications", Tata McGraw-Hill, 2/e.

4. Haykin S., Moher M., "Introduction to Analog & Digital Communications", Wiley India Pvt. Ltd., 2/e.

Reference Book:

1. Boylstead R.L., Nashelsky L., "Electronic Devices and Circuit Theory", Pearson Education, Inc, 10/e.

Engineering Physics

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Engineering Physics
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	BS
Course Objective	This course enables the students to understand 1. To explain principles of physical optics. 2. To construct Maxwell's equations from basic principles and use it to solve electromagnetic plane wave equations. 3. To distinguish between Newtonian Mechanics and special theory of relativity and develop the relationship of length contraction, time dilation and Einstein energy mass relation and to apply the concepts of special theory of relativity in various field of physics and engineering. 4. To illustrate the phenomena of old quantum theory and derive Heisenberg uncertainty principle and Schrödinger's equations. 5. To understand basic lasing action, study various types of lasers and to have basic idea of fiber optics.
Course Outcome (COs)	After the completion of this course, students will be able to CO1. To interpret the intensity variation of light due to Polarization, interference and diffraction.

	CO2. To formulate and solve the engineering problems on electromagnetism CO3. To explain special theory of relativity and apply its concepts in various fields of physics and engineering. CO4. To explain fundamentals of quantum mechanics and apply it to problems on bound states CO5. To analyze working principle of lasers and to summarize its applications.

Course Outline

Unit	Description	CO Mapping
UNIT 1	Physical Optics: Polarization, Malus' Law, Brewster's Law, Double Refraction, Interference in thin films (Parallel films), Interference in wedge-shaped layers, Newton's rings, Fraunhofer diffraction by single slit, Double slit.	CO1
UNIT 2	Electromagnetic Theory: Curl, Gradient, Divergence, Gauss theorem, Stokes theorem, Gauss's law, Applications, Concept of electric potential, Relationship between E and V, Polarization of dielectrics, dielectric constant, Boundary conditions for E & D, Gauss's law in magnetostatics, Ampere's circuital law, Boundary conditions for B & H, Equation of continuity of charge, Displacement current, Maxwell's equations.	CO2
UNIT 3	Special Theory of Relativity: Introduction, Inertial frame of reference, Galilean transformations, Postulates, Lorentz transformations and its conclusions, Length contraction, time dilation, velocity addition, Mass change, Einstein's mass energy relation.	CO3
UNIT 4	Quantum Mechanics: Planck's theory of black-body radiation, Compton effect, Wave particle duality, De Broglie waves, Davisson and Germer's experiment, Uncertainty principle, physical interpretation of wave function, Schrodinger equation in one dimension, free particle, particle in an infinite square well.	CO4
UNIT 5	Lasers: Spontaneous and stimulated emission, Einstein's A and B coefficients, Population inversion, Light amplification, Basic laser action, Ruby and He-Ne lasers, Properties and applications of laser radiation, Elementary ideas of fiber optic cables	CO5

Evaluation:

Mode of Evaluation	Laboratory

Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text books:

1: A. Ghatak, Optics, 4th Edition, Tata Mcgraw Hill, 2009

2: Mathew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press (2001)

3: Arthur Beiser, Concept of Modern Physics, 6th edition 2009, Tata McGraw- Hill

Reference books:

1: Fundamentals of Physics, Halliday, Walker and Resnick

Corporate Communications

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Corporate Communications
Course Code	
Credit	L-T-P- 2-0-0 Total Credit - 2
Course Type	HS
Course Objective	This course enables the students to understand 1. To gain a comprehensive understanding of the principles, theories, and models underlying corporate communication practices in various organizational contexts 2. To enhance oral, written, and digital communication skills essential for conveying corporate messages effectively, 3. To critically evaluate real-world corporate communication strategies and campaigns, examining their effectiveness, ethical implications, and impact on stakeholders 4. To analyze and solve communication challenges faced by corporations 5. To explore the ethical dimensions and cultural nuances of corporate communication

Course Outcome (COs)	After the completion of this course, students will be able to CO1. Demonstrate proficiency in crafting and delivering corporate messages across various communication channels, including written, verbal, and digital platforms. CO2. Analyze and evaluate the effectiveness of corporate communication strategies by applying theoretical frameworks and considering ethical and cultural factors. CO3. Develop comprehensive communication plans tailored to corporate objectives, incorporating audience analysis, message framing, and channel selection. CO4. Improve their interpersonal communication skills, including active listening, conflict resolution, and negotiation. CO5. Develop an awareness of ethical issues in corporate communication and cultivate professionalism in their interactions, demonstrating sensitivity to cultural diversity and ethical dilemmas.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Foundations of Corporate Communication** 1.1: Introduction to Corporate Communication Overview of corporate communication principles and theories: Organizational communication, Corporate Identity, and Reputation Management. Introduction to communication models like the Shannon-Weaver Model, Transactional Model, and Coordinated Management of Meaning (CMM) Historical evolution and current trends: Historical development of corporate communication from traditional forms to contemporary practices. Current trends such as Digital Transformation, Stakeholder Engagement, and Sustainability Communication. 1.2: Communication Skills Development Writing effective corporate communications: crafting clear, concise, and professional written communication, including emails, memos, reports, and press releases. Oral communication skills development: Exercises to improve public speaking skills, Audience Analysis. Including structuring presentations, using visual aids effectively, and delivering persuasive speeches. Role-playing scenarios to enhance verbal communication in meetings, negotiations, and Foundations of Corporate Communication	CO1

UNIT 2	**Analyzing Corporate Communication Strategies** 2.1: Understanding Communication Strategies Models and frameworks for analyzing communication strategies: Exploration of theoretical frameworks such as the RACE model (Research, Action, Communication, Evaluation) and PESO model (Paid, Earned, Shared, Owned). Application of strategic communication planning tools like SWOT analysis, stakeholder mapping, and message mapping. 2.2: Case studies analysis Analysis of real-world corporate communication campaigns, including successful and unsuccessful examples. Identification of key elements such as objectives, target audience, messaging, channels, and evaluation metrics.	CO2
UNIT 3	**Communication Ethics** 3.1. Ethical dimensions in corporate communication Ethical principles: honesty, transparency, integrity, and accountability, in corporate communication. Ethical theories: Consequentialism, Deontology, Social Contract Theory 3.2: Ethical dilemmas Examination of ethical dilemmas faced by organizations through case studies	CO3
UNIT 4	**Digital Communication and Interpersonal Skills** 4.1: Digital Communication Strategies Role of digital communication and social media: Exploration of the impact of digital technologies and social media platforms on corporate communication practices. Developing social media strategies: Best practices for leveraging digital channels for brand building, and customer engagement, Planning and executing social media campaigns to achieve communication objectives, including content creation, community management, and performance measurement to Linkedin. 4.2: Interpersonal Communication Skills Enhancing interpersonal communication skills: active listening, empathy, and nonverbal communication to improve interpersonal interactions in professional settings. Conflict resolution techniques: Strategies for identifying sources of conflict, facilitating constructive dialogue, and negotiating mutually acceptable solutions.	CO4
UNIT 5	**Global Communication and Cultural Competence** 5.1: Cultural Dimensions in Communication	CO5

	Understanding cultural nuances in communication: Cultural Dimensions, Cross-cultural communication etiquette, Cultural barriers and how to overcome them.	

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text books:

1. Excellence in Public Relations and Communication Management; by James E. Grunig,Larissa A. Grunig, David M. Dozier, and Fred C. Repper. Routledge Abingdon, UK. 2013

2. Business Ethics: Ethical Decision Making & Cases; by O.C. Ferrell, John Fraedrich, and Linda Ferrell Cengage Learning Boston, MA, USA. 2018

Reference books:

3. Strategic Planning for Public Relations; by Ronald D. Smith. Routledge Abingdon, UK. 2019

4. Digital Marketing: Strategy, Implementation and Practice; by Dave Chaffey and Fiona Ellis-Chadwick. Pearson Harlow, UK. 2019

5. The Culture Map: Breaking Through the Invisible Boundaries of Global Business; by Erin Meyer. Public Affairs New York, NY, USA. 2014

Design Thinking

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Design Thinking
Course Code	
Credit	L-T-P- 2-0-0 Total Credit - 2
Course Type	HS
Course Objective	1. Inculcate the fundamental concepts of design thinking 2. Develop the students as a good designer by imparting creativity and problem solving ability 3. Conceive, conceptualize, design and demonstrate innovative ideas using prototypes
Course Outcome (COs)	After the completion of this course, students will be able to

	CO1. Demonstrate the critical theories of design, systems thinking, and design methodologies CO2. Produce great designs, be a more effective engineer, and communicate with high emotional and intellectual impact CO3. Understand the diverse methods employed in design thinking and establish a workable design thinking framework to use in their practices CO4. Conceive, organize, lead and implement projects in interdisciplinary domain and address social concerns with innovative approaches CO5.

Unit	Description	CO Mapping
UNIT 1	**Introduction to Design Thinking:** Definition and Principles, History and Evolution, Importance in Engineering and Computer Science **Design Thinking Process:** Empathize, Define, Ideate, Prototype, Test **Empathize** User Research Techniques, Interviews and Observations, Creating Empathy Maps	CO1
UNIT 2	**Define:** Problem Statement, Point of View (POV), Defining User Needs and Insights **Ideate:** Brainstorming Techniques, Creative Thinking, Idea Generation Tools **Prototype:** Prototyping Methods, Rapid Prototyping, Low-fidelity vs. High-fidelity Prototypes	CO2
UNIT 3	**Test:** Usability Testing, Gathering Feedback, Iterative Design **Tools and Techniques**: Software Tools (e.g., Sketch, Figma, Adobe XD), Physical Prototyping Tools, Storyboarding **Application in Computer Science:** Case Studies, Design Thinking in Software Development, User-Centered Design in Technology Projects	CO3

UNIT 4	**Teamwork and Collaboration:** Collaborative Design Techniques, Team Dynamics and Roles, Communication Skills **Real-world Projects:** Project-based Learning, Industry Collaborations, Capstone Project **Evaluation and Reflection:** Reflective Practices, Self and Peer Assessment, Continuous Improvement	CO4
UNIT 5	**Ethics and Social Responsibility:** Ethical Considerations in Design, Impact of Design on Society, Sustainability in Design **Final Project:** Problem Identification, Design Process Documentation, Presentation and Demonstration	CO5

Text books:

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
2. IdrisMootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc

Reference Books:

1. Brenda Laurel Design Research methods and perspectives MIT press 2003
2. Terwiesch, C. & Ulrich, K.T., 2009. Innovation Tournaments: creating and identifying Exceptional Opportunities, Harvard business press.
3. Ulrich &Eppinger, Product Design and Development, 3rd Edition, McGraw Hill, 2004
4. Stuart Pugh, Total Design: Integrated Methods for Successful Product Engineering, BjarkiHallgrimsson, Prototyping and model making for product design, 2012, Laurence King Publishing Ltd
5. Kevin Henry, Drawing for Product designers, 2012, Laurence King Publishing Ltd

PRACTICAL/SESSIONAL

Basic Electronics Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Basic Electronics Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	ES
Course Objective	This course enables the students 1. To demonstrate the measurement of voltage, frequency using CRO 2. To explain PN junction characteristics and its applications. 3. To understand the frequency response of BJT amplifier and OPAMP. 4. To Realize logic gates and implement simple Boolean expression. 5. To explain the Amplitude Modulation and Frequency Modulation
Course Outcome (COs)	After the completion of this course, students will be able to CO1. Make use of CRO for measuring different parameters CO2. Appraise PN junction characteristics and its applications. CO3. Experiment with Diodes, BJT and OPAMP CO4. Design specified circuit using given electronic components/ICs/logic gates. CO5. Demonstrate the working of Amplitude Modulation and Frequency Modulation.

Course Outline

Unit	**Description**
Lab 1	Measurement of voltage, time period and frequency of different signals on CRO. Measurement of frequency and phase of two different signals using Lissajous pattern.
Lab 2	To determine the forward and reverse bias characteristics of PN junction diode.
Lab 3	To determine the reverse bias characteristics of Zener diode and application as a voltage Regulator.

Lab 4	Measurement of rectification efficiency and ripple factor of Half-wave and Full-wave rectifier Circuits with and without C-Filter.
Lab 5	To determine the frequency response of CE transistor amplifier and finding its gain bandwidth product.
Lab 6	To determine the transfer characteristics of JFET and measurement of its voltage gain.
Lab 7	Design of RC phase shift oscillator using IC-741 Op-Amp and finding its frequency of oscillation.
Lab 8	Design of Inverting and Non-inverting amplifier using IC 741 OP-AMP and finding its frequency response.
Lab 9	Realization of Basic logic gates (AND, OR, NOT) using NAND Gate (IC-7400
Lab 10	Implementation of Boolean expression F = (A.B.C + D.E) using AND Gate(IC 7408) and OR Gate (IC 7432).
Lab 11	Generation of Amplitude modulated wave and calculation of percentage of modulation using standard setup
Lab 12	Generation of FM-wave and its detection using standard setup.

Text Books:

1. Millman J., Halkias C.C., Parikh Chetan, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw-Hill, 2/e.
2. Mano M.M., "Digital Logic and Computer Design", Pearson Education, Inc, Thirteenth Impression, 2011.
3. Singal T. L., "Analog and Digital Communications", Tata McGraw-Hill, 2/e.
4. Haykin S., Moher M., "Introduction to Analog & Digital Communications", Wiley India Pvt. Ltd., 2/e.

Reference Book:

1. Boylstead R.L., Nashelsky L., "Electronic Devices and Circuit Theory", Pearson Education, Inc,

Data Structure Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Data Structure Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	PC

Course Objective	6. Develop programs for performing different operations on Arrays, Stack, Queue, Linked list. Analyze the difference between them and understand different applications. 7. Develop programs for understanding different searching and sorting methods and their applications.
Course Outcome (COs)	After the completion of this course, students will be able to CO6. Understand the basic concepts of data structures, remember the fundamental concepts. CO7. Understand the programming by comparing the types of data structures concepts. CO8. Develop the codes for implementing different operations on data structures. CO9. Analyses of the codes regarding different operations on data structures. CO10. Solve and evaluate complex problems by coding on linear and non-linear data structures. CO11. Design the codes on advanced concepts of data structure by implementation in different application of data structure.

Course Outline

Experiment-1**(functions and arrays)** Q1) Write a program to create an UDF for input 10 numbers into a 1D array. Create two functions MAX() and MIN(). MAX() is used to return the largest element and MIN() is used to return the smallest number in array. Q2) Write a C program to create methods for operations insertion and display on 1D array of elements using UDF. Q3) Write a C program to create methods for operations deletion, and display on 1D array of elements using UDF.
Experiment 2: **(concepts of matrix and sparse matrix)** Q1) Write a C program to create function for performing matrix multiplication using UDF Q2) Write a C program to input elements into a square matrix and display the transpose of it using UDF. Q3) Write a program to input elements into a 4X4 matrix, check it for sparse or not. If sparse then store the non-zero elements into an alternate matrix and then display it using UDF.
Experiment 3: **(Pointer, structure and DMA)** Q1) Write a program to store N numbers using dynamic memory allocation and then find the largest element using UDF. Q2) Write a C program to create a structure called student to store your rollno, name, age. Create an array to input 5 students data and then create an UDF to display details where age>=20.

Q3) Write a program to create a structure for products of a super market. Store product no, name and cost for N products using dynamic memory allocation. Display the products whose cost is in between 100 rupees to 1000 rupees.

Experiment 4: **(stack and queue)**

Q1) Write a program using C to create a stack of numbers and perform using UDF:
(i) push operation (ii) pop operation (iii) display operation

Q2) Write a C program to create a linear queue and perform the following operations using UDF:
(i) insertion ii) deletion and iii) Traversal

Q3) Write a C program to create a circular queue and perform the following operations using UDF: (i) insertion ii) deletion and iii) Traversal

Experiment 5: **(searching and sorting)**

Q1) Write a program to implement binary search on array elements using UDF

Q2) write a program to implement selection sort on a given list of array elements.

Q3) Write a program to input a string and sort the alphabets in ascending order using bubble sort.

Experiment 6: **(sorting and merging)**

Q1) Write a program to input elements into two arrays A[5] and B[5]. Input the elements in ascending order and then merge their values into a resultant array C[10] in sorted manner using UDF.

Q2) Write a program to implement insertion sort on a given list of array elements.

Experiment 7 : **(single linked list)**

Q1) Write a C program to perform the operations on a single linked list:
i) Insertion at beginning, ii) Deletion of 1st node iii) display all nodes

Q2) Write a C program to perform the operations on a single linked list:
i) insertion at end, i) deletion of last node iii) display all the nodes

Q3) Write a C program to perform the operations on a single linked list:
i) insertion at location ii) searching for a node item iii) display all the nodes.

Experiment-8 : **(linked stack and linked queue)**

Q1) Write a C program that uses functions to implement linked stack on single linked list.

Q2) Write a C program that uses functions to implement linked queue on single linked list.

Experiment-9 **(double linked list)**

Q1) Write a C program to perform the operations on a single linked list:
i) Insertion at beginning, ii) Deletion of 1st node iii) display all nodes

Q2) Write a C program to perform the operations on a single linked list:
i) insertion at end, i) deletion of last node iii) display all the nodes

Experiment 10: **(Advanced Programs using linked list)**

Q1) Write a program to create a single linked list for storing the N cricket player details having member's player name, team name and batting average. Display only those players information whose batting average>=50

Q2) Write a program to create a double linked list for storing account details of bank customers such as AC no, name, balance. Store details for N bank account holders and find the total balance for all account holders.

Topic Beyond Syllabus:

Q1) Write a C program to implement quick sort to a given list of integers to sort in ascending order.
Q2) Write a program to construction a Binary Search Tree for storing N unique numbers. Apply insertion(), deletion() and display() operation on it using UDF.
Q3) Write a program to create a connected graph when its adjacency list is given and display it.

Evaluation:

Mode of Evaluation	Laboratory	
Weightage	Continuous Evaluation	End Semester Examination
	60	40

Text Books:

1. "Fundamental of Data Structure" (Schaums Series) Tata-McGraw-Hill.

2. Pai: "Data Structures & Algorithms; Concepts, Techniques & Algorithms "Tata McGraw Hill.

3. Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson publication

Reference Books:

1. "Fundamentals of data structure in C" Horowitz, Sahani & Freed, Computer Science Press.

2. "Data Structures and algorithms" by Narasimha Karumanchi, CareerMonk Publications

3. "Data structures through C in depth" by S.K.Srivastava, BPB Publications

Corporate Communication Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	II
Course Title	Corporate Communications Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1

Course Type	HS
Course Objective	This course enables the students to understand 1. To gain a comprehensive understanding of the principles, theories, and models underlying corporate communication practices in various organizational contexts 2. To enhance oral, written, and digital communication skills essential for conveying corporate messages effectively, 3. To critically evaluate real-world corporate communication strategies and campaigns, examining their effectiveness, ethical implications, and impact on stakeholders 4. To analyze and solve communication challenges faced by corporations 5. To explore the ethical dimensions and cultural nuances of corporate communication
Course Outcome (COs)	After the completion of this course, students will be able to CO1. Demonstrate proficiency in crafting and delivering corporate messages across various communication channels, including written, verbal, and digital platforms. CO2. Analyze and evaluate the effectiveness of corporate communication strategies by applying theoretical frameworks and considering ethical and cultural factors. CO3. Develop comprehensive communication plans tailored to corporate objectives, incorporating audience analysis, message framing, and channel selection. CO4. Improve their interpersonal communication skills, including active listening, conflict resolution, and negotiation. CO5. Develop an awareness of ethical issues in corporate communication and cultivate professionalism in their interactions, demonstrating sensitivity to cultural diversity and ethical dilemmas.

Course Outline

Lab	ACTIVITIES TO BE COVERED
LAB 1	**Cover Letter Writing** •Introduction to the importance of cover letters in job applications. •Components of a cover letter: introduction, body, conclusion. •Analyzing sample cover letters. •Interactive session: students draft their cover letters. •Peer review and feedback.

LAB 2	**CV/Resume Building** • Understanding the purpose and structure of a CV/resume. • Crafting impactful CV/resume content: education, work experience, skills, achievements. • Design and formatting tips. • Hands-on activity: students create their CVs/resumes using templates or online tools.
LAB 3	**Group Discussion Skills** • Importance of group discussions in the selection process. • Strategies for effective participation: active listening, articulation, persuasion. • Handling different types of GD topics: abstract, case-based, and opinion-based. • Conducting mock group discussions. • Peer evaluation and feedback on performance.
LAB 4	**Verbal Ability Enhancement** • Vocabulary-building exercises: synonyms, antonyms, word roots. • Grammar and sentence structure practice. • Interactive games and quizzes to reinforce verbal ability concepts
LAB 5	**Verbal Ability Enhancement (CONT...)** • Vocabulary-building exercises: synonyms, antonyms, word roots. • Grammar and sentence structure practice. • Interactive games and quizzes to reinforce verbal ability concepts
LAB 6	**Mock Interview Preparation (Part 1)** • Types of interviews: behavioral, competency-based, situational. • Understanding common interview questions and how to answer them. • Conducting practice interviews • Feedback on interview performance and areas for improvement.
LAB 7	**Integration and Practice** • Integrating cover letter writing, CV/resume building, group discussion, mock interview, and verbal ability skills. • Practical exercises combining multiple skills: e.g., conducting a mock interview based on a job posting, followed by group discussion and feedback. • Individualized coaching sessions for refining specific skills.

	• Final review and assessment of progress made throughout the lab.
LAB 8	**Review and Wrap-Up** • Recap of key learnings and skills acquired. • Opportunities for additional practice and skill development. • Q&A session to address any remaining doubts or questions. • Distribution of certificates of completion. • Encouragement for ongoing self-improvement and professional development.

Text books:

1. Excellence in Public Relations and Communication Management; by James E. Grunig,Larissa A. Grunig, David M. Dozier, and Fred C. Repper. Routledge Abingdon, UK. 2013

2. Business Ethics: Ethical Decision Making & Cases; by O.C. Ferrell, John Fraedrich, and Linda Ferrell Cengage Learning Boston, MA, USA. 2018

Reference books:

3. Strategic Planning for Public Relations; by Ronald D. Smith. Routledge Abingdon, UK. 2019

4. Digital Marketing: Strategy, Implementation and Practice; by Dave Chaffey and Fiona Ellis-Chadwick. Pearson Harlow, UK. 2019

5. The Culture Map: Breaking Through the Invisible Boundaries of Global Business; by Erin Meyer. Public Affairs New York, NY, USA. 2014

SECOND YEAR

Discrete Mathematics

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	III
Course Title	Discrete Mathematics
Course Code	
Credit	L-T-P- 3-1-0 Total Credit - 4
Course Type	
Course Objective	The subject aims to provide the student with: CO1. To introduce the concepts of mathematical logic CO2. To introduce the concepts of sets, relations, and functions. CO3. To perform the operations associated with sets, functions, and relations. CO4. To introduce generating functions and recurrence relations. CO5. To relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context. To use Graph Theory for solving problems
Course Outcome (COs)	At the end of the course, the students will be able to CO1: Understand set and set relation mathematical terminology and notation. CO2: Construct direct, and indirect, proofs of basic theorems. CO3: Understand the differences between a mathematical proof, a heuristic, and a conjecture. CO4: Learn how to divide a problem, or a proof, into smaller cases. CO5: Formulate mathematical claims and be able to construct counterexamples.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Set, Relations, Functions** Set, Relations, Functions. Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite	CO1

	Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem.	
UNIT 2	**Proof strategies and Proof Methods** Proof strategies. Proof Methods and Strategies: Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency, Case analysis, Induction. Modular Arithmetic. Extended Euclid's Greatest Common Divisor algorithm, The Fundamental Theorem of Arithmetic, Modular arithmetic, Coprimality (or Euler's totient function), Chinese Remainder	CO2
UNIT 3	**Combinatorics** Combinatorics. Permutation & Combination, Inclusion-Exclusion, Pigeon-hole principle, Graphs. Connected components, Paths, Cycles, Trees, Hamiltonian/ Eulerian Walks, Colouring, Planarity, Matching.	CO3
UNIT 4	**Logic** Logic Languages of Propositional logic and First-order logic, expressing natural language sentences in languages of propositional and first-order logic, expressing natural language predicates in the language of first-order logic. Semantics of First order logic: interpretation and its use in evaluating a formula. Optional advanced topics if there is extra time: Semantic entailment, Validity and Satisfiability. What is a proof system? E.g. natural deduction or analytical tableau. Notions of Consistency and Completeness of a logic.	CO4
UNIT 5	**Algebra** Algebra. Group, Permutation Groups, Cosets, Normal Subgroups, Ring, Field, Finite fields, Fermat's little theorem, Homomorphisms, Isomorphisms. Discrete probability. Topics to be taught from the viewpoint of CS instead of Maths: Discrete Sample Space, Probability Distribution, Random variables, Expectation, Variance, Bernoulli trials, Conditional probability & independence (Bayes' Theorem).	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination

	40	60

Text Books:

T1. Singh, S.B., Discrete Mathematics, Khanna Book Publishing Company, New Delhi.
T2. Liu, C. L., & Mohapatra, D. P. (2008). Elements of Discrete Mathematics. Tata McGraw-Hill.
T3. Rosen, K. H. (2019). Discrete Mathematics and Its Applications. (8th Edition) ISBN10: 125967651X
ISBN13: 9781259676512.
T4. Huth, M., & Ryan, M. (2004). Logic in Computer Science: Modelling and Reasoning about Systems (2nd ed.). Cambridge University Press.
T5. Cohen, D. I. A. (1978). Basic techniques of combinatorial theory. John Wiley.

Reference Books:

R1. Norman L. Biggs, Discrete Mathematics, (2nd ed. 2002), Oxford University Press.
R2. Smullyan, R. M. (1995). First-order logic. Courier Corporation.
R3. Bóna, M. (2006). A walk through combinatorics: an introduction to enumeration and graph theory.
R4. Cameron, P. J. (1994). Combinatorics: topics, techniques, algorithms. Cambridge University Press.
R5. Shoup, V. (2009). A computational introduction to number theory and algebra. Cambridge University Press.

Database Management Systems

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	III
Course Title	Database Management Systems
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	
Course Objective	The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve efficiently and effectively information from a DBMS.

Course Outcome (COs)	After completion of this course students will be able to: CO1: Design and implement database schema for an application us RDBMS concepts. CO2: Write SQL queries for tasks of various complexities. CO3: Write an application program that uses a database system as the backend. CO4: Understand the internal working of a DBMS including data storage, indexing, query processing, transaction processing, and concurrency control and recovery mechanisms. CO5: Aware of non-relational and parallel/distributed data management systems with a focus on scalability.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Introduction** Introduction (i) Motivation (ii) Introduction to Data Models (Relational, Semi structured, ER) Relational Databases (i) Relational Data Model (ii) Relational Algebra (iii) Relational Calculus or Connection to First Order Logic (Optional)	CO1
UNIT 2	**Data Defination Language** (i) DDL (ii) Insert/Delete/Update (i) Laboratory exercises where students write SQL queries for various tasks. Interacting with database (iii) Simple Queries (select/project/join/ aggregate queries) (iv) Complex queries (With Clause, Nested Sub queries, Views) (v) Programming in a standard language and interfacing with a DB backend Platform can be PostgreSQL preferably, or MySQL.	CO2
UNIT 3	**Key-value Stores** Big Data Key-value Stores and Semi structured Data, using JSON and MongoDB, or other combinations (i) Small exercises on MongoDB Database Design (i) Introduction to ER model (ii) Mapping from ER to relational model (iii)Functional Dependencies (iv) Normalization (BCNF, Optionally 3NF) (i) Exercise in ER design for an application starting with natural language description (ii) Convert ER design to tables (iii) Pen-and-paper exercises with FDs and normalization	CO3
UNIT4	**Physical Design** Physical Design (i) Overview of Physical Storage (Hard Disks, Flash/SSD/RAM), sequential vs random I/O, Reliability via RAID	CO4

	(ii) Storage Organization (Records, Pages and Files), Database Buffers, Database Metadata (iii) Indexing, B+-Trees (i) Use a B+-tree visualization system to understand how B+- trees work , Query Processing and Optimization (i) Query Processing: External sort, Joins using nested loops, indexed nested loops (ii) Overview of Query Optimization: equivalent expressions, and concept of cost based optimization (i) Examine query plans for sample queries	
UNIT5	**Transaction Processing** Transaction Processing (i) Concept of transactions and schedules, ACID properties (ii) Conflict-serializability (iii) Concurrency control: locks, 2PL, Strict 2PL, optional: isolation levels (iv) Recovery using undo and redo logs (i) Pen-and-paper exercises on conflicts, cycles, conflict serializability, recoverability, etc.	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1. Database System Concepts, 7th Edition, Silberschatz, Korth and Sudarshan, McGraw-Hill Indian Edition released 2021
T2. Fundamentals of Database Systems, 7th Edition, Elmasri and Navathe, Pearson Pubs, 2017
T3. Principles of Database Management, Lemahieu, Broucke and Baesens, Cambridge University Press, 2018
T4. Database Management Systems, RP Mahapatra, Khanna Publishing House, 2020.
T5. Database Management Systems, Krishnan, McGraw Hill.

Reference Books:

R1: Relax Relational algebra calculator: https://dbis-uibk.github.io/relax/landing
R2: SQL: PostgreSQL/MySQL/MariaDB, or SQLite in browser
R3: B+-tree visualization: https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html
R4: MongoDB: Various DB systems playground: https://www.pdbmbook.com/playground

Digital System Design

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	III
Course Title	Digital System Design
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	
Course Objective	1. To understand common forms of number representation in logic circuits 2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems. 3. To understand the concepts of combinational logic circuits and sequential circuits. 4. To understand the Realization of Logic Gates Using Diodes & Transistors.
Course Outcome (COs)	At the end of the course, the students will be able to: CO1: Understand the numerical information in different forms and Boolean Algebra theorems CO2: Postulates of Boolean algebra and to minimize combinational functions CO3: Design and analyse combinational and sequential circuits CO4: Analyze and explain uses of small- and medium-scale logic functions as building blocks. CO5: Known about the logic families and realization of logic gates.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Number Systems: N**umber systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties,	CO1

	Parity check code and Hamming code. **Boolean Algebra:** Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.	
UNIT 2	**Minimization of Boolean functions:** Karnaugh Map Method – Up to five Variables, Don't Care Map Entries, Tabular Method, **Combinational Logic Circuits:** Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.	CO2
UNIT 3	**Sequential Circuits Fundamentals:** Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another. **Registers and Counters:** Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers – Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.	CO3
UNIT 4	**Sequential Machines:** Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters. Finite state machine-capabilities and limitations, Mealy and Moore models.	CO4
UNIT 5	**Realization of Logic Gates Using Diodes & Transistors:** AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate- Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri- state outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1: Switching and Finite Automata Theory – Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010.

T2: Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- Tata McGraw-Hill

T3: Digital Design- Morris Mano, PHI, 4th Edition, 2006.

T4: Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.

Reference Books:

R1: Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.

R2: Switching Theory and Logic Design – A Anand Kumar, PHI, 2013.

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	III
Course Title	OBJECT ORIENTED PROGRAMMING THROUGH JAVA
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	
Course Objective	The course aims to introduce the fundamental concepts of Object-Oriented programming, design & implement object oriented programming concepts in Java.
Course Outcomes (COs)	At the end of the Course the student shall be able to: CO1: Implement object orientated programming strategies and Contrast classes and objects. CO2: Analyze Inheritance and Dynamic Method Dispatch. CO3: Demonstrate various classes in different packages and can design own packages.

	CO4: Manage Exceptions and Apply Threads. CO5: Create GUI screens along with event handling and write network programs.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**INTRODUCTION TO OBJECTS & CLASSES**: What is Object Oriented Programming? Object Orientation as a New Paradigm: An Overview of Java: Process Oriented Vs Object Oriented Programming, OOP Principles, Java Buzz Words, The Byte Code, A First Simple Program. Class Fundamentals with Variables and Methods, Declaring objects for accessing variables and methods. Data Types and Variables, Operators and Expressions, Control Statements, Type Conversion and casting. Arrays: Single Dimension, command line arguments, Arrays: Multi Dimension. Constructors: Default and Parameterized, this keyword and Garbage Collection, Final and Static Keywords, Overloading Methods, Overloading Constructors, Using objects as Parameters, Returning objects, String and String Buffer	CO1
UNIT 2	**INHERITANCE:** Inheritance Basics, Types of Inheritance, Using Super keyword for constructors, Super to call variables and methods, Method Overriding, Dynamic Method Dispatch Learning Outcomes:	CO2
UNIT 3	**PACKAGES AND INTERFACES**: Defining a Package, importing a package, Package Example, Access Protection, An Access Example, Abstract classes, Interfaces: Defining and Implementing Interfaces EXPLORING java. Lang: Wrapper classes, Object, Math, Runtime EXPLORING java.util:The collection framework: Array List, Hash Set and Hash Map, StringTokenizer, Calendar, Random, Scanner EXPLORING java.io: File class, Byte Streams, Character Streams, File Input Stream, FileOutputStream, File Reader and File Writer	CO3
UNIT 4	**EXCEPTION HANDLING:** Exception Handling Fundamentals, Exception Types, throw, throws and finally, Creating your own exceptions, Chained Exceptions.	CO4

	MULTITHREADED PROGRAMMING: Java Thread Model, The Main thread, Two ways of Creating a Thread, Creating Multiple Threads, isAlive(),join(), Synchronization, Inter Thread	
UNIT 5	**INTRODUCING GUI PROGRAMMING WITH SWINGS**: Swing Features, MVC Connection, Components and Containers, Panes, Simple Swing Application, Simple Swing Applet, Layout Managers: Flow, Border, Card, Grid, Grid Bag, Working with Color, Working with Fonts, Painting in Swing, Exploring Swing Components DELEGATION EVENT MODEL: Event Classes, Sources and Listeners. EXPLORING JAVA.NET: Socket, ServerSocket, InetAddress, DataGramSocket, URL, ClientServer Program using Sockets	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1. Herbert Schildt, Java The complete reference, 11th Edition, McGraw-Hill, 2019
T2. Timothy budd, An introduction to object-oriented programming, 3rd Edition, Pearson, 2009.

Reference Books:

R1. Cay S. Horstmann, Core Java Volume I–Fundamentals, 11th Edition, Pearson 2019

R2. Y. Daniel Liang Introduction to Java Programming Comprehensive Version, 10th Edition, Pearson, 2015.

R3. Bruce Eckel, Thinking in Java, 4th Edition, Prentice Hall, 2006

Computer Network

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering

Semester	I
Course Title	Computer Network
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	
Course Objective	This course introduces students to the fundamental principles of computer networks and to their use in the Internet and motivates students with familiar uses and problems of their digital world and enables them to work with real-world applications from early in the course.
Course Outcome (COs)	At the end of the course the student shall: CO1: Understand the architecture principles that have enabled the orders of magnitude expansion of the internet. CO2: Analysed networked applications and their protocols, their installation, operation and performance tuning. CO3: Demonstrate layering as a means of tackling complexity, layering applied to the Internet. CO4: Understand protocols as a structured means of reliable communications. CO5: Be conversant with network programming using the socket API and tools for configuring, monitoring and tuning the Internet and hosts.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Introduction to the Internet Overview** Introduction to the Internet Overview of how the Internet works. Understand at a high level what happens when we browse a website. Understand basic terminology like browser, web server, URL, domain name, IP address, packets. Overview of the design principles of the Internet: packet switching vs circuit switching, store-and forward networks, layering for modularity. Introduction to the various layers in the Internet. Introduction to performance metrics like end-to-end throughput, delay, jitter and drop rates in a network. Statement of Little's Law. How performance is measured	CO1
UNIT 2	**Application layer** Application layer - Internet names, how DNS works. - Application layer protocols: HTTP, SMTP, SNMP, web applications.- Peer-to-	CO2

	peer applications. P2P file distribution. Audio and video streaming. Challenges of streaming over best effort IP. Linux Network Programming - Introduction to socket programming in Linux. Understand how to build a simple client-server application using TCP/UDP sockets.	
UNIT 3	**Transport Layer** Transport Layer Importance of the transport layer; end-to-end principle. Transport layer protocols: basics of TCP and UDP, process-to process delivery, multiplexing, port numbers, and header structure. Reliable transmission of packets over an unreliable network: sequence numbers, ACKs, timeout, retransmissions. Stop and wait, and sliding window. - TCP connection setup and teardown. Flow control and congestion control at the transport layer. Differences between the two. Overview of TCP congestion control: Slow start and reaction to timeouts TCP congestion control: Slow start; congestion avoidance using loss-based and delay-based control	CO3
UNIT 4	**The IP Layer** The IP Layer **Network architecture and performance** Network topology; Router architecture: queuing and switching. Performance evaluation of a network link: traffic characteristics, performance Measures, **IP Protocol** Need for an Internet address, and its design. Hierarchical IP addressing, IPv4 and IPv6, structure of IP datagram, IP forwarding. - NATs, security attacks and defences: DMZ firewalls. Routing protocols and Internet architecture Routing protocols: Link state routing. Distance vector routing: count-to-infinity, routing convergence. Understand the structure of the Internet: end-user organizations and ISPs. Understand the difference between intra-domain (OSPF) and inter-domain (BGP) routing. Intra-domain routing: OSPF.	CO4
UNIT 5	Data Link Layer Mechanisms for error detection/recovery: Parity checks, CRC Medium access protocols: Polling vs. contention-based: TDM, Aloha, CSMA/CD Switched LANs: L2 addressing and ARP, Ethernet frame structure, learning switches. Wireless Networks Wireless physical layer: signal to- noise ratio, bit error rate, modulation, multipath, interference Wireless LANs: 802.11 architecture (access points, SSID, channels, beacons, scanning, association), 802.11 CSMA-CA protocol; summary of 802.11 variants	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1. J.F. Kurose and K.F. Ross, Computer networking: a top-down approach, 6th edition, Pearson, 2017. (6th edition is low-cost Indian edition. 7th edition is high-cost, may be used if available).
T2. Bhavneet Sidhu, an Integrated Approach to Computer Networks, Khanna Publishing House, 2021.

Reference Books:

R1. R. Jain, The art of computer systems performance analysis, Wiley India, 1991.
R2. S.K. Bose, an Introduction to Queuing Systems, Springer Science + Business Media New York, 2012.
R3. A.S. Tanenbaum and D.J. Wetherall, Computer Networks, 5th edition, Pearson, 2013.
R4. Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, 6th Edition

PRACTICAL / SESSIONAL
Digital System Design Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	III
Course Title	Digital System Design Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	
Course Objective	1. To understand common forms of number representation in logic circuits. 2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems. 3. To understand the concepts of combinational logic circuits and sequential circuits.

	4. To understand the Realization of Logic Gates Using Diodes & Transistors.
Course Outcome (COs)	CO1: Construct digital circuit to examine Boolean algebra, truth table of different logic gates. CO2: Design various combinational and sequential circuits after analysing their timing properties. CO3: Demonstrate digital circuits using VHDL and other software.

Course Outline

Unit	**Description**
Lab 1	Introduction to Digital Electronics Lab- Nomenclature of Digital Ics, Specifications, Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs
Lab 2	Implementation of the Given Boolean Function using Logic Gates in Both Sop and Pos Forms.
Lab 3	Verification of State Tables of Rs, J-k, T and D Flip-Flops using NAND & NOR Gates
Lab 4	Implementation and Verification of Decoder/De-Multiplexer and Encoder using Logic Gates.
Lab 5	Implementation of 4x1 multiplexer using Logic Gates.
Lab 6	Implementation of 4-Bit Parallel Adder Using 7483 IC.
Lab 7	Design, and Verify the 4- Bit Synchronous Counter
Lab 8	Design, and Verify the 4-Bit Asynchronous Counter.
Lab 9	Simulation of MOS Inverter with different loads using PSPICE software 10.
Lab 10	Simulation of CMOS Inverter for different parameters Kn, Kp as a design variable in suitable circuit simulator software.
Lab 11	Design of a 4-bit Multiplexer using VHDL\Verilog
Lab 12	Design of a decade counter using VHDL\Verilog.

Lab 13	Design of a 3-input NAND gate and its simulation using suitable logic simulator

Text Books:

T1: Switching and Finite Automata Theory – Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010.

T2: Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- Tata McGraw-Hill

T3: Digital Design- Morris Mano, PHI, 4th Edition, 2006.

T4: Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.

Reference Books:

R1: Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.

R2: Switching Theory and Logic Design – A Anand Kumar, PHI, 2013.

Object Oriented Programming Using Java lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	III
Course Title	Object Oriented Programming Using Java lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	
Course Objectives	The course aims to introduce the fundamental concepts of Object-Oriented programming, design & implement object oriented programming concepts in Java.

Course Outcomes (COs)	Upon completion of the course, the students will be able to CO1: Develop and implement Java programs for simple applications that make use of classes, packages and interfaces. CO2: Develop and implement Java programs with array list, exception handling and multithreading. CO3: Design applications using file processing, CO4: Demonstrate generic programming CO5: Apply the concept of event handling.

Course Outline

Unit	Description
Lab 1	Program to define a structure of a basic JAVA program.
Lab 2	Program to define the data types, variable, operators, arrays and control structures.
Lab 3	Program to define class and constructors. Demonstrate constructors.
Lab 4	Program to define class, methods and objects. Demonstrate method overloading.
Lab 5	Program to define inheritance and show method overriding.
Lab 6	Program to demonstrate Packages.
Lab 7	Program to demonstrate Exception Handling.
Lab 8	Program to demonstrate Multithreading.
Lab 9	Program to demonstrate I/O operations.
Lab 10	Program to demonstrate Network Programming.
Lab 11	Design of a 4-bit Multiplexer using VHDL\Verilog
Lab 12	Program to demonstrate Applet structure and event handling.
Lab 13	Program to demonstrate Layout managers.

Text Books:

T1. Herbert Schildt, Java The complete reference, 11th Edition, McGraw-Hill, 2019
T2. Timothy budd, An introduction to object-oriented programming, 3rd Edition, Pearson, 2009.

Reference Books:

R1. Cay S. Horstmann, Core Java Volume I–Fundamentals, 11th Edition, Pearson 2019

R2. Y. Daniel Liang Introduction to Java Programming Comprehensive Version, 10th Edition, Pearson, 2015.

R3. Bruce Eckel, Thinking in Java, 4th Edition, Prentice Hall, 2006

Database Management Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	III
Course Title	Database Management Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	
Course Objectives	The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve efficiently and effectively information from a DBMS.
Course Outcome (COs)	Upon completion of the course, the students will be able to CO1: Develop database modelling for a problem. CO2: Design a database using normalization. CO3: Implement a data base query language. CO4: Develop GUI using front end tool. CO5: Develop a connection between frontend and database and Implement a Data Manipulation Language.

Course Outline

Unit	Description

Lab 1	Data Definition, Manipulation of base tables and views
Lab 2	Design a Database and create required tables. For e.g. Bank, College Database
Lab 3	Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
Lab 4	Write a sql statement for implementing ALTER,UPDATE and DELETE
Lab 5	Write the queries to implement the joins
Lab 6	Write the query for implementing the following functions: MAX(),MIN(),AVG(),COUNT()
Lab 7	Write the query to implement the concept of Integrity constraints
Lab 8	Write the query to create the views
Lab 9	Write code for High level programming language extensions.
Lab 10	Code on Front end tools.
Lab 11	Perform the queries for triggers
Lab 12	Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints
Lab 13	Write the query for creating the users and their role.

Text Books:

T1. Database System Concepts, 7th Edition, Silberschatz, Korth and Sudarshan, McGraw-Hill Indian Edition released 2021
T2. Fundamentals of Database Systems, 7th Edition, Elmasri and Navathe, Pearson Pubs, 2017
T3. Principles of Database Management, Lemahieu, Broucke and Baesens, Cambridge University Press, 2018
T4. Database Management Systems, RP Mahapatra, Khanna Publishing House, 2020.
T5. Database Management Systems, Krishnan, McGraw Hill.

Reference Books:

R1: Relax Relational algebra calculator: https://dbis-uibk.github.io/relax/landing

R2: SQL: PostgreSQL/MySQL/MariaDB, or SQLite in browser
R3: B+-tree visualization: https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html
R4: MongoDB: Various DB systems playground: https://www.pdbmbook.com/playground

Fundamentals of Python Programming

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	IV
Course Title	Fundamentals of Python Programming
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	
Course Objective	The course will enable students to: 1. Learn the syntax and semantics of Python Programming Language 2. Write Python functions to facilitate code reuse and manipulate strings. 3. Illustrate the process of structuring the data using lists, tuples and dictionaries. 4. Demonstrate the use of built-in functions to navigate the file system. 5. Appraise the need for working on web scraping
Course Outcome (COs)	Upon successful completion of this course, student will be able to CO1: Demonstrate the concepts of control structures in Python. CO2: Implement Python programs using functions and strings. CO3: Implement methods to create and manipulate lists, tuples and dictionaries. CO4: Apply the concepts of file handling and regEx using packages. CO5: Illustrate the working of scraping websites with CSV.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Introduction** Introduction, Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in	CO1

	Variables, Your First Program, Dissecting Your Program. Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit().	
UNIT 2	**Functions** Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling. Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods. Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things. Manipulating Strings - Working with Strings, Useful String Methods	CO2
UNIT 3	**Pattern Matching with Regular Expressions** Pattern Matching with Regular Expressions: Finding Patterns of Text without Regular Expressions, Finding Patterns of Text with Regular Expressions, More Pattern Matching with Regular Expressions, Greedy and Nongreedy Matching, The findall() Method, Character Classes, Making Your Own Character Classes, The Caret and Dollar Sign Characters, The Wildcard Character, Review of Regex Symbols, Case-Insensitive Matching, Substituting Strings with the sub() Method, Managing Complex Regexes, Combining re.IGNORECASE, re .DOTALL, and re .VERBOSE.	CO3
UNIT 4	**Files** Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the pprint.pformat() Function. Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile	CO4
UNIT 5	**Web Scraping** Web Scraping: Project: MAPIT.PY with the web browser Module, Downloading Files from the Web with the requests Module, Saving Downloaded Files to the Hard Drive, HTML. Working with Excel Spreadsheets: Excel Documents, Installing the openpyxl Module, Reading Excel Documents, Project: Reading Data from a Spreadsheet, Writing Excel Documents, Project:	CO5

	Updating a Spreadsheet, Setting the Font Style of Cells, Font Objects, Formulas, Adjusting Rows and Columns,	

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1: Al Sweigart, "Automate the Boring Stuff with Python", William Pollock, 2015, ISBN: 978-1593275990

Reference Books:

R1: Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755.

R2: Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.

R3: Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365.

R4: Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python", 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176.

R5: Reema Thareja, "Python Programming using problem solving approach", Oxford University press, 2017. ISBN-13: 978-0199480173

Computer Organization & Architecture

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	IV
Course Title	Computer Organization & Architecture
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	

Course Objective	To expose the students to the following: 1. How Computer Systems work & the basic principles 2. Instruction Level Architecture and Instruction Execution 3. The current state of art in memory system design 4. How I/O devices are accessed and its principles. 5. To provide the knowledge on Instruction Level Parallelism
Course Outcome (COs)	Upon successful completion of this course, student will be able to CO1: Demonstrate the key components of a basic computer. CO2: Understand the key components of a CPU and how the instructions are executed. CO3: Implement the pipelined processor to understand the execution and time taken by instructions. CO4: Analyse the need for memory hierarchy and efficiency achieved due to the use of cache. CO5: understand the data storage and input-output operation performed in computers.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Introduction** Introduction Role of abstraction, basic functional units of a computer, Von-Neumann model of computation, A note on Moore's law, Notion of IPC, and performance. Data representation and basic Operations.	CO1
UNIT 2	**Instruction Set Architecture** Instruction Set Architecture (RISC-V) CPU registers, instruction format and encoding, addressing modes, instruction set, instruction types, instruction decoding and execution, basic instruction cycle, Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer	CO2
UNIT 3	**The Processor** The Processor Revisiting clocking methodology, Amdahl's law, Building a data path and control, single cycle processor, multi-cycle processor, instruction pipelining, Notion of ILP, data and control hazards and their mitigations.	CO3

UNIT 4	**Memory hierarchy** Memory hierarchy SRAM/DRAM, locality of reference, Caching: different indexing mechanisms, Trade-offs related to block size, associativity, and cache size, Processor-cache interactions for a read/write request, basic optimizations like write through/ write-back caches, Average memory access time, Cache replacement policies (LRU), Memory interleaving.	CO4
UNIT 5	**Storage and I/O** Storage and I/O Introduction to magnetic disks (notion of tracks, sectors), flash memory. I/O mapped, and memory mapped I/O. I/O data transfer techniques: programmed I/O, Interrupt-driven I/O, and DMA. Superscalar processors and multicore systems Limits of ILP, SMT processors, Introduction to multicore systems and cache coherence issues.	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1: "Computer Organization and Design: The Hardware/Software Interface", David A.Patterson and John L. Hennessy, 5th Edition, Elsevier

Reference Books:

R1: "Computer Organisation & Architecture", Smruti Ranjan Sarangi, McGraw Hill
R2: "Computer System Architecture", Mano M. Morris, Pearson.
R3: "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraHill
Higher Education
R4: "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
R5: "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

Design and Analysis of Algorithms

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	IV
Course Title	Design and Analysis of Algorithms
Course Code	
Credit	L-T-P- 3-0-0 Total Credit - 3
Course Type	
Course Objective	The primary objective of this course is to introduce the concept of algorithm as a precise mathematical concept, and study how to design algorithms, establish their correctness, study their efficiency and memory needs.
Course Outcome (COs)	At the end of this course students will be able to CO1: Identify various Time and Space complexities of various algorithms CO2: Understand Tree Traversal method and Greedy Algorithms CO3: Apply Dynamic Programming concept to solve various problems CO4: Apply Backtracking, Branch and Bound concept to solve various problems CO5: Implement different performance analysis methods for non-deterministic algorithms.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Introduction** Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation-big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.	CO1
UNIT 2	DIVIDE AND CONQUER	CO2

	General method, applications-analysis of binary search, quick sort, merge sort, AND OR Graphs. GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.	
UNIT 3	**Pattern Matching with Regular Expressions** Breadth first search and traversal, Depth first search and traversal, Spanning trees, connected components and bi-connected components, Articulation points. DYNAMIC PROGRAMMING: General method, applications - optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.	CO3
UNIT 4	**Files** General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles. BRANCH AND BOUND: General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution	CO4
UNIT 5	**Web Scraping** Basic concepts, non-deterministic algorithms, NP-hard and NP-complete classes, Cook‘s theorem.	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1: Ellis Horowitz, Satraj Sahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.

Reference Books:

R1: R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai (2006), Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.
R2: Allen Weiss (2009), Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.
R3: Aho, Ullman, Hopcroft (2009), Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi

Operating System

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	IV
Course Title	Operating System
Course Code	
Credit	L-T-P- 3-1-0 Total Credit - 4
Course Type	
Course Objective	1. To educate students regarding basics of operating system. 2. To sensitize students about organization and process scheduling. 3. To equip students with concurrency. 4. To train students about memory management. 5. To inculcate the benefits of File systems and storage management.
Course Outcome (COs)	After completion of this course students will be able to: CO1: Understand the basic concepts of operating system. CO2: Apply the organization and process scheduling. CO3: Analyse the process synchronization. CO4: An understanding of memory management. CO5:Develop understanding of File systems and storage management.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Introduction** Functions, components and structure of OS. Types of Operating Systems– Multiprogramming, Batch and Time Shared; Operating Systems for Personal Computers, Workstations, Hand-held Devices, Real time Systems, Operating System services, System Calls.	CO1
UNIT 2	**Organization and Process Scheduling** Processor and User Modes, Kernels, Process and Resources, Context switching, Threads, Threading Issues, Thread Libraries; Process Scheduling, Non-Pre-emptive and Pre-emptive Scheduling Algorithms, Multiprocessor scheduling. Deadlocks - Resource	CO2

	allocation and management, conditions for deadlock, Deadlock handling mechanisms: prevention, avoidance, detection, recovery.	
UNIT 3	**Process Synchronization** Inter-process communication, Synchronization - Implementing synchronization primitives (Peterson's solution, Bakery algorithm, synchronization hardware), Semaphores, Classical synchronization problems, Monitors, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc., Multiprocessors and Locking - Scalable Locks - Lock-free coordination.	CO3
UNIT 4	**Memory Management** Physical and Virtual Address Space; Main memory management, Memory Allocation Strategies, Virtual memory: Hardware support for virtual memory (caching, TLB), Paging, Segmentation, Demand Paging, Page Faults, Page Replacement, Thrashing - Working Set.	CO4
UNIT 5	**File Systems, storage management and security** Concept of a file, Directory Structure, File Operations, File System Mounting, File Sharing, Protection, File System Structure, File System Implementation, I/O Systems- Overview of Mass Storage Structure, Device Drivers, Disk Structure, Disk Scheduling, Disk Management, and Swap space Management, Free-space Management, Directory Implementation, RAID Structure	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1: Silberschatz, A., Galvin, P.B., & Gagne, G. (2008). Operating Systems Concepts (8th ed.). John Wiley Publications.

Reference Books:

R1: Tanenbaum, A. S. (2016). Modern Operating Systems (4th ed.). Pearson.

R2: Stallings, W. (2018). Operating Systems: Internals and Design Principles (9th ed.). Pearson.

R3: Milenkovic, M. (1992). Operating Systems: Concepts and Design. Tata McGraw Hill.

Artificial Intelligence

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	IV
Course Title	Artificial Intelligence
Course Code	
Credit	L-T-P- 3-0-0 Total Credit – 3
Course Type	
Course Objective	The subject aims to provide the student with: 1. Develop a comprehensive understanding of the fundamental concepts and applications of Artificial Intelligence. 2. Gain knowledge of the major techniques and technologies used in Machine Learning and their applications in various domains. 3. Develop an understanding of Natural Language Processing and its applications in fields such as chatbots, sentiment analysis, and language translation. 4. Explore the applications and techniques of Computer Vision in real-world scenarios and understand the ethical considerations related to its use. 5. Stay up-to-date with emerging trends and advancements in AI, and understand their implications for society and the workforce.
Course Outcome (COs)	After completion of this course students will be able to: CO1: Students will be able to define Artificial Intelligence, describe its history and applications, and analyze ethical considerations related to AI. CO2: Students will be able to understand the basics of Machine Learning, including the different types of algorithms, data preparation, and processing. They will also be able to identify successful Machine Learning projects. CO3: Students will be able to identify the different techniques used in Natural Language Processing, understand the applications of NLP, and identify the ethical considerations related to NLP. CO4: Students will be able to identify the different techniques used in Computer Vision, understand the applications of Computer Vision, and identify the ethical considerations related to Computer Vision.

	CO5: Students will be able to identify emerging trends in Artificial Intelligence, including advanced AI technologies and techniques, AI and IoT, AI and Robotics, and future directions of AI research and development. They will also be able to analyze the implications of AI for society and the workforce.

Course Outline

Unit	Description	CO Mapping
UNIT 1	**Introduction to Artificial Intelligence**: Definition of Artificial Intelligence, Brief history of Artificial Intelligence, Applications of Artificial Intelligence, Ethical considerations in Artificial Intelligence, Overview of AI technologies and techniques	CO1
UNIT 2	**Machine Learning**: Introduction to Machine Learning, Types of Machine Learning algorithms, Supervised, unsupervised and reinforcement learning, Data preparation and processing for Machine Learning, Case studies of successful Machine Learning projects	CO2
UNIT 3	**Natural Language Processing (NLP)**: Introduction to NLP, Basic techniques of NLP, Applications of NLP, NLP libraries and tools, Ethical considerations in NLP	CO3
UNIT 4	**Computer Vision**: Introduction to Computer Vision, Basic techniques of Computer Vision, Applications of Computer Vision, Computer Vision libraries and tools, Ethical considerations in Computer Vision	CO4
UNIT 5	**Emerging Trends in Artificial Intelligence**: Advanced AI technologies and techniques, AI and Internet of Things (IoT), AI and Robotics, Future directions of AI research and development, Implications of AI for society and the workforce	CO5

Evaluation:

Mode of Evaluation	Theory	
Weightage	Continuous Evaluation	End Semester Examination
	40	60

Text Books:

T1: Russell, S. J., & Norvig, P. (2020). Artificial intelligence: A modern approach. Pearson

Reference Books:

R1: Bishop, C. M. (2006). Pattern recognition and machine learning. Springer.

R2: Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep learning. MIT press.

R3: Shane, M. (2018). Artificial intelligence and ethics. Morgan & Claypool Publishers.

Fundamentals of Python Programming Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	IV
Course Title	Fundamentals of Python Programming Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	ES
Course Objective	This course enables the students 1. To be able to introduce core programming basics and program design with functions using Python programming language. 2. To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques. 3. To understand the high-performance programs designed to strengthen the practical expertise.
Course Outcome (COs)	Upon the completion, the student will be able to: CO1: Student should be able to understand the basic concepts scripting and the contributions of scripting language CO2: Ability to explore python especially the object oriented concepts, and the built in objects of Python.

Course Outline

Unit	**Description**
Lab 1	Programs on Introduction to Python and Computer Programming
Lab 2	Data Types, Variables, Basic Input-Output Operations, Basic Operators
Lab 3	Boolean Values, Conditional Execution, Loops.
Lab 4	Lists and List Processing, Logical and Bitwise Operations

Lab 5	Functions, Tuples
Lab 6	Dictionaries, and Data Processing
Lab 7	Modules, Packages, String and List Methods, and Exceptions
Lab 8	The Object-Oriented Approach: Classes, Methods, Objects, and the Standard Objective Features;
Lab 9	Exception Handling, and Working with Files
Lab 10	Programs on web scraping
Lab 11	Programs on sheet update

Text Books:

T1: Al Sweigart, "Automate the Boring Stuff with Python", William Pollock, 2015, ISBN: 978-1593275990

Reference Books:

R1: Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755.

R2: Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.

R3: Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365.

R4: Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python", 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176.

R5: Reema Thareja, "Python Programming using problem solving approach", Oxford University press, 2017. ISBN-13: 978-0199480173

Design and Analysis of Algorithms Lab

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	IV

Course Title	Design and Analysis of Algorithms Lab
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	ES
Course Objective	This course enables the students 1. The principle objective of this course is to build solid foundation in algorithms and their applications. To implement various divide and conquer techniques examples. 2. To implement various Greedy techniques examples. 3. To implement various Dynamic Programming techniques examples. 4. To provide a practical exposure of all algorithms. 5. To understand the importance of algorithm and its complexities.
Course Outcome (COs)	At the end of the Course the student shall be able to CO1: Develop programs for sorting a given set of elements and analyse its time complexity. CO2: Solve and analyse the problems using greedy methods. CO3: Solve and analyse the problems using dynamic programming. CO4: Apply backtracking method to solve various problems. CO5: Apply branch and bound method to solve 0/1 knapsack problem.

Course Outline

Unit	**Description**
Lab 1	Implementation of search algorithms
Lab 2	Analysis of time and space complexities
Lab 3	Programs on Sorting Algorithms: Selection sort, Insertion sort, Heap sort
Lab 4	Programs on Sorting Algorithms: Merge sort, Quick sort;
Lab 5	Programs on Binary Search Tree and Tree traversals.
Lab 6	Shortest path algorithms: Kruskal, Prim's, Dijkstra,
Lab 7	Implementation of Floyd –Warshall, Bellman-Ford;

Lab 8	Programs on Graph Traversal: DFS, BFS; Back Tracking,
Lab 9	Exception Handling, and Working with Files
Lab 10	Programs on Dynamic Programming. Height Balanced Tree.
Lab 11	Programs on P-NP, NP complete problem

Text Books:

T1: Ellis Horowitz, Satraj Sahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.

Reference Books:

R1: R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai (2006), Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.
R2: Allen Weiss (2009), Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.
R3: Aho, Ullman, Hopcroft (2009), Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi

UNIX and Shell Programming Laboratory

School	Birla School of Engineering & Technology
Programme	Bachelor of Technology (B.Tech)
Batch	2024-28
Branch/Discipline	Computer Science & Engineering
Semester	IV
Course Title	Unix and Shell Programming Laboratory
Course Code	
Credit	L-T-P- 0-0-2 Total Credit - 1
Course Type	ES
Course Objective	To teach students various Unix utilities and shell scripting.
Course Outcome (COs)	At the end of the Course the student shall be able to CO1: Understand the basic UNIX process structure and the UNIX file system.

	CO2: Understand the roles of unix developers / systems programmers CO3: Good knowledge of simple UNIX filters. And Familiar with pipes and redirection, imagine the UNIX environment. CO4: Practice various commands related to Signals, filter parameters and options, CO5: Differentiate shell scripting and commands practice with various options.

Course Outline

Unit	Description
Lab 1	Use of basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.
Lab 2	Study of vi editor
Lab 3	Commands related to inode, I/O redirection, piping, process control commands, mails.
Lab 4	Shell Programming: shell script exercise based on following: a) Interactive shell script b) Positional parameters c) Arithmetic d) If-then-fi, if-then-else-fi, nested if-else e) Logical operators f) Else + if equals elif, case structure g) While, for loop h) Meta characters
Lab 5	Write a shell script to create a file in $USER /class/batch directory. Follow the Instructions a) Input a page profile to yourself, copy it into other existing file b) Start printing file at certain line c) Print all the difference between two file, copy the two files at $USER/CSC/2007 directory. d) Print lines matching certain word pattern.
Lab 6	Write shell script for- 1. Showing the count of users logged in 2. Printing Column list of files in your home directory. 3. Listing your job with below normal priority 4. Continue running your job after logging out.

Lab 7	Write a shell script to change date format. Show the time taken in execution of this script.
Lab 8	Write a shell script to print file names in directory showing date of creation & serial no. of file.
Lab 9	Write a shell script to count lines, words & characters in its input. (Do not use wc).
Lab 10	Write a shell script to print end of a Glossary file in reverse order using array.
Lab 11	Write a shell script to check whether Ram logged in, continue checking further after every 30 seconds till success.