OP JINDAL UNIVERSITY

Raigarh-Chhattisgarh

Scheme and Syllabus

Of

B. Tech. (01UG020)

Department of

Computer Science and Engineering

School of Engineering

Batch 2023-2027

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme Outcome (PO)

1. **Engineering Knowledge and Problem Analysis** -- Apply the knowledge of engineering domain with adequate amalgamation of science, mathematics, and management to Identify, formulate, and critically analyze complex engineering problems.
2. **Modern tools and techniques for investigating complex problems** – Apply appropriate tools and techniques to analyze, predict and simulate the data for valid conclusion with clear understanding of limitations.
3. **Design and development of innovative systems**: design and develop system components or processes to provide solutions of complex engineering problems that meet the specified conditions of societal, health, safety, and environmental needs.
4. **Communication and Teamwork -** Develop skills to communicate effectively to diverse platforms and contribute meaningfully to different capacities as a leader, team member or individual.
5. **Project management and finance**: Develop and apply knowledge of engineering, management, and finance principles to handle a project in a multidisciplinary environment.
6. **Life-long learning**: Acquire fundamental knowledge for lifelong learning to participate in the extensive context of socio-technological change as a self-directed member and a leader.
7. **Ethics and citizenship**: Apply ethical principles and commit to professional ethics, norms, and responsibilities of the engineering practice; and act with informed awareness to participate in civic life activities.
8. **Society, Sustainability and Environment** -- Understand the impact of various solutions in the context of societal, economical, health, safety legal and environmental impact for sustainable development.

Programme Specific Outcome (PSO)

- **PSO_1:** Inculcate strong fundamental knowledge and foundation skills of computer systems, hardware, software, networks, data structures, algorithms and different aspects of the core computing and allied domains.
- **PSO_2:** Ability to analyze, design, develop and deploy elementary programs and projects, individually and collaboratively, in the areas related to web and app development, artificial intelligence and analytics, databases and cloud computing and for other IT / ITeS with proper structure and development methodologies.
- **PSO_3:** Ability to analyze and think critically and apply emerging tools, technologies and computing knowledge under a multidisciplinary environment for creating innovative solutions and startups.
- **PSO_4:** ability to adapt and quickly learn rapidly changing technologies and work environment to cater the contemporary needs of global IT industry and entrepreneurship.

OPJU
UNIVERSITY OF STEEL TECHNOLOGY AND MANAGEMENT

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Scheme for B. Tech (CSE) Programme

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering)

Academic Semester I

Type of Course	Subject Code	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
			L	P	T	PRE** Mid Sem	PRE** TA	ESE*	Total Marks	(L+T+P)
Core Course	SOS-B-MAT-23-101	Engg. Mathematics-1 (Matrices and Linear Algebra)	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-102	Digital System Design	2	0	0	15	10	25	50	2
Core Course	SOE-B-EE-23-103	Basic Electrical & Electronics	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-104	Basic Computation SKills (C-Programming)	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-105	Computer Fundamentals	2	0	0	15	10	25	50	2
AECC	SOS-B-HUM-23-106	Communicative English	2	0	0	15	10	25	50	2
AECC	SOE-B-CIV-23-107	Environmental Sc. (Hindi / English)	2	0	0	15	10	25	50	2
Core Course	SOE-B-EE-23-108	Basic Electrical & Electronics Lab	0	2	0	0	30	20	50	1
Core Course	SOE-B-CSE-23-109	Basic Computation SKills (C-Programming) Lab)	0	2	0	0	30	20	50	1
Core Course	SOE-B-CSE-23-110	Digital System Design Lab	0	2	0	0	30	20	50	1
Core Course	SOE-B-CSE-23-111	Computer Fundamentals Lab	0	4	0	0	30	20	50	2
		Total	17	10	0	150	220	330	700	22

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Academic Semester II

Type of Course	Subject Code	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
			L	P	T	PRE** Mid Sem	PRE** TA	ESE*	Total Marks	(L+T+P)
Core Course	SOS-B-MAT-23-201	Engg. Mathematics – 2 (Calculus and Differential Equation)	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-202	Data Structure	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-203	Comp. Organization and Architecture	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-204	IT Workshop	0	4	0	0	30	20	50	2
Core Course	SOE-B-CSE-23-205	Python Programming	2	0	0	15	10	25	50	2
GE	SOS-B-HUM-23-206	Indian Knowledge System	3	0	0	30	20	50	100	3
SEC	SOM-B-MBA-23-207	Problem Solving & Design Thinking	2	0	0	15	10	25	50	2
Core Course	SOE-B-CSE-23-208	Data Structure Lab	0	2	0	0	30	20	50	1
Core Course	SOE-B-CSE-23-209	Python Programming Lab	0	2	0	0	30	20	50	1
SEC	SOE-B-CSE-23-210	Universal Human Values	--	--	--	--	--	--	--	--
		Total	16	8	0	150	190	310	650	20

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**:**	**B. Tech.**	**Semester**	**:**	**I**
Name of the Course	**:**	**Matrices and Linear Algebra**	**Course Code**	**:**	**SOS-B-MAT-23-101**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs/week**
Max Marks	**:**	**100**			

Course Description:
The course will introduce basic concepts and techniques from linear algebra that will be required in later courses in areas such as machine learning, computer graphics, quantum computing. Also, to expose student to understand the basic importance of matrices.

Course Outcomes:
At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	find basis of finite dimensional vector spaces.
CO2	learn about inner product, and how to transform a set of non-zero vectors into an orthonormal set.
CO3	learn to solve systems of linear equations, and to find inverse of a matrix by using Gauss-Jordan elimination method.
CO4	find rank/nullity and eigenvalues/eigenvectors of a matrix and learn about the diagonalization of a matrix.
CO5	understand the properties of linear transformation

Syllabus:

Unit-I:
Matrix operations. Rank of a matrix. Inverse of matrix. The Gauss-Jordan method. Solvability of systems of linear equations, Gaussian elimination. Row echelon form. Homogeneous and nonhomogeneous systems of linear equations.

Unit-II:
Eigen values, Eigen vectors, Diagonalization of matrices, Reduction of a quadratic form to canonical form. Vector in two and three dimensions. Algebraic properties. Dot products and properties.

Unit-III:
Vector space, subspace, linear span, linear dependence and independence, Basis and dimension of vector space, Row and column spaces. Linear Transformation.

Unit-IV:
Orthogonal vectors, norm of a vector, Inner product spaces, Gram-Schmidt Orthogonalization, Ortho-normalization, Rank and nullity, Rank-Nullity Theorem, Matrix representation of Linear Transformations.

Unit-V:

Application to the intersection of lines and planes, Properties and composition of linear transformations. Rotations, reflections and stretches. Translations using homogeneous coordinates. One-to-one and onto transformations.

Text Book

- Gilbert Strang, "Introduction to Linear Algebra", Wellesley-Cambridge press.
- J. Defranza and D. Gagliardi, "Introduction to Linear Algebra with Applications", McGraw-Hill

Reference Book

- Serge Lang, "Introduction to Linear Algebra", (2nd edition), Springer
- Seymour Lipschutz, Marc Lipson, "Schaum's outlines of Linear Algebra", McGraw-Hill Education (India) Private Limited, New Delhi
- K. Hoffman and R. Kunze, "Linear Algebra", Prentice Hall

CO-PO & PSO Correlation

Course Name: Engineering Mathematics - I												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	1										
CO2:	1	2										
CO3:	1	1	1									
CO4:	1		1									
CO5:	1											

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme :	**B.Tech.**	**Semester :**	**I**
Name of the Course :	**Digital System Design**	**Course Code:**	**SOS-B-CSE-23-102**
Credits :	**2**	**No of Hours :**	**2**
Max Marks :	**50**		

Course Description

Digital circuits are the basic blocks of modern electronic devices like mobile phones, digital cameras, microprocessors and several other devices. In this course, we will learn the fundamentals of digital circuits and how to engineer the building blocks that go into digital subsystems. We will learn the basics of combinational as well as sequential logic. We will also have a thorough treatment of sequential circuits and state machines. We will also learn how to analyze the performance of digital circuits. The course will emphasize on the design philosophy as well as good design practices used. Students will also get an exposure to Verilog, a popular hardware modeling language.

Course Outcomes

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Introduce basic digital circuit, electronics and system design concepts and get hands on with basic digital system design using standard ICs.
CO2	Basics of Boolean algebra, logic minimization techniques, combination circuits design.
CO3	Basics of flip-flops and different sequential circuits design, etc.
CO4	Acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
CO5	Prepare students to perform the analysis and design of various digital electronic circuits.

Syllabus:

Unit-I: Number system and Logic Gates

Binary number system, Octal, Hexa decimal, base conversions, signed and unsigned numbers, complements, addition, subtraction using complements, Different Binary codes, operation, Truth tables of different logic gates.

Unit-II: Boolean Algebra and K-maps

Basic Theorems and postulates, properties of Boolean algebra, Boolean functions, standard and canonical forms, 2,3,4- variable K-map methods of simplification, NAND/NOR implementations, other two level implementations, Multi-level implementations, 2-3 variable XOR function, Logic Simplification using Tabular method, etc.

Unit-III: Combinational Circuit Design
Design procedure, Different Adders and Subtractors-Half Adder, Full Adder, Half Subtractor, Full Subtractor, 4-bit Ripple Carry Adder, Carry Look Ahead Adder, Decoder, Encoders, Multiplexers, De-Multiplexers, Magnitude Comparator, etc.

Unit-IV: Sequential Circuit Design
Basics, Latches and Flip-flops, conversion from one FF to another, Designing of serial and Parallel Registers, Synchronous and Asynchronous Counter Designing, Mealy and Moore Machine.

Unit-V: Programmable Logic Devices
Simple and Complex PLDs (SPLD and CPLD), Field-programmable gate array (FPGA), Programmable array logic (PAL), Programmable logic array (PLA), Generic array logic (GAL) Designing. Logic Families: Basic concept, designing of basic logic families like Resistor Transistor Logic (RTL), Direct Coupled Transistor Logic (DCTL), Transistor Transistor Logic (TTL), Emitter Coupled Logic (ECL), etc. M OS Logic families like NAND and NOR using NMOSFET and PMOSFET, CMOS Logic family, etc.

Text Books:

- R.P. Jain, “Modern Digital Electronics”, 3rd Edition, Tata McGraw Hill.
- T.L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson education.
- M. Morris Mano, Michael D. Ciletti, "Digital Design- with an Introduction to the Verilog HDL", 5th Ed, Pearson.

Reference Books:

- Schaum's Outline of Digital Electronics, Second Edition (Schaum's Outline Series) by Jimmie.
- Brian Holdsworth, Clive Woods, "Digital Logic Design", Elsevier India Pvt. Ltd., 2005.
- A.P. Malvino and D.P. Leach, “Digital Principles and Applications”, 6th Edition, Tata McGraw-Hill, 2008

CO-PO & PSO Correlation

Course Name: Digital System Design												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2								2			
CO2:	2	1							1			
CO3:	2	1									2	
CO4:	1	1									2	
CO5:		2	2							2	2	

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme:	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Basic Electrical and Electronics Engineering**	**Course Code:**	**SOE-B-EE-23-103**
Credits :	**3**	**No of Hours :**	**3 Hrs/Week**
Max Marks:	**100**		

Course Description:

The subject curriculum focuses on fundamentals of electrical and electronic circuits. It covers the DC and AC electrical circuit analysis, magnetic circuit analysis and description of basic electronics components and their applications.

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Ability to define and explain the meaning/function of charge, current, voltage, power
CO2	Understand the behavior of inductance (L) and capacitance (C) in AC circuit
CO3	To analyze magnetic materials and their characteristics.
CO4	To understand semiconductors and their applications.
CO5	Understand the basics of analog and digital logics

Course Contents:

UNIT-1: DC Electrical Circuit Analysis:

Voltage and current sources, dependent and independent sources, Source Conversion, Star-delta and delta-star conversions, Ohm's Law, Kirchhoff's Laws & their limitations, Nodal analysis, loop analysis and Mesh current methods, Superposition principle, Thevenin's and Norton's theorems, Maximum power transfer theorem.

UNIT-2: AC Circuits:

Single- phase AC Circuits: Single phase emf generation, average and effective values of sinusoids, R.M.S. value, form factor and peak factor of AC quantity, Concept of phasor diagram, Concept of Power factor, impedance and admittance, Active, reactive and apparent power, analysis of R-L, R- C, R-L-C series, parallel and series-parallel circuit and Resonance condition.

UNIT-3: Magnetic Circuits:
Basic definitions, magnetization characteristics of Ferro magnetic materials, self-inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, AC excitation in magnetic circuits, magnetic field produced by current carrying conductor, Force on a current carrying conductor. Induced voltage, fundamental laws of electromagnetic Induction, direction of induced E.M.F.

UNIT-4: Semiconductor Diodes:
Introduction to semiconductor, Formation of P-N Junction, P-N Junction Diodes; Semiconductor Diodes, V-I Characteristics, Effect of Temperature on V-I Characteristics, Ideal Diode, Diode equation, Diode Resistance, Transition and Diffusion Capacitance. Light Emitting Diode, Zener Diode, Photodiode. Applications of Diodes.

UNIT-5: Transistors:
Transistor: Introduction, Construction, Types: npn and pnp, Current components. Transistor as amplifier, Transistor Characteristics. Digital logic fundamentals, Boolean Algebra, truth table, Logic Gates.

Text Books:

- E. Hughes, Electrical Technology, ELBS, 1997.
- B L Theraja, Electrical technology, Basic Electrical Engineering, Volume 1, S Chand.
- Integrated Electronics: Analog & Digital Circuit Systems – Jacob Millman & Halkias, TMH.
- Electronic Devices and Circuit Theory – Boylestad & Nashelsky

Reference Books:

- Charles & Sadiku, Fundamentals of Electric circuits, TMH, Third Edition.
- V. D. Toro, Basic Electrical Engineering, PHI, 2000.

CO-PO & PSO Correlation:

Course Name: Basic Electrical & Electronics Engineering												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	2	2			2						
CO2:	3	3	2									
CO3:	3	3	3									
CO4:	3	3	3									
CO5:	3	1	3			2						

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**:**	**B.Tech.**	**Semester**	**:**	**I**
Name of the Course	**:**	**Basic Computation Skills**	**Course Code:**		**SOE-B-CSE-23-104**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs/Week**
Max Marks	**:**	**100**			

Course Description:

This course offers lecture, laboratory, and case studies to impart teaching and learning to develop problem solving approaches to systematic represent identified problem into design using flowcharts, algorithms and pseudocode leading towards programming through systemic refinements. This course focus on fundamental concepts of elementary c programming including Arrays, Strings, Pointers, Functions, Structures, Unions, Enum, Storage classes, Dynamic memory allocation and File Handling.

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Understand the semantics and syntax of C programming language.
CO2	Analyze problem domain, formulate solution and implement it using C programming language.
CO3	Learn the syntax, semantics and language constructs to write efficient code using C.
CO4	Appreciate the importance and use of pointers and dynamic memory allocation.

Syllabus:

Unit- 01: Fundamentals of C Programming

Algorithm & Flowchart: Three construct of Algorithm and flowchart: Sequence, Decision (Selection) and Repetition.

Character Set, Identifiers and keywords, Data types, Constants, Variables. Operators: Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, other operators. Expression, statements, Library Functions, Preprocessor. Data Input and Output: getchar( ), putchar( ), scanf( ), printf( ), gets( ), puts( ), Structure of C program .

Unit- 02: Control Structures

Branching: If statement, If-else Statement, Multiway decision. Looping: while do-while, for. Nested control structure: Switch statement, Continue statement Break statement, goto statement.

Unit- 03: Functions and Parameters

Function: Introduction of Function, Function Main, Defining a Function, Accessing a Function, Function Prototype, Passing Arguments to a Function, Recursion. Storage Classes: Auto, Extern, Static, Register

Unit- 04: Arrays, String, Structure and Union

Array: Concepts, Declaration, Definition, Accessing array element, One-dimensional and Multidimensional array. String: Basic of String, Array of String, Functions in String.h Structure: Declaration, Initialization, structure within structure, Operation on structures, Array of Structure. Union: Definition, Difference between structure and union, Operations on a union

Unit- 05: Pointer and File

Pointer: Introduction, Definition and uses of Pointers, Address Operator, Pointer Variables, Dereferencing Pointer, Void Pointer, Pointer Arithmetic, Pointers to Pointers, Pointers and Array, Passing Arrays to Function, Pointers and Function, Pointers and two-dimensional Array, Array of Pointers, Dynamic Memory Allocation.

Files: Types of Files, File operation- Opening, Closing, Creating, Reading, Processing File.

Text Books:

- Yashavant Kanetkar ,Let Us C: Authentic guide to C programming language , 19th Edition ,Paperback 2022.
- E Balagurusamy, Programming in ANSI C, 8/e, McGraw-Hill India, 2019.
- Herbert Schildt, C: The Complete Reference, Fourth Edition, McGraw Hill Education, 2017.

References Books:

- A. B. Chaudhuri, Flowchart and Algorithm Basics: The Art of Programming, Mercury Learning & Information, 2020.
- Brajendra Singh, Jignesh Rawal, Pathik Rawal, Algorithm, Pseudocode and Flowchart: Learn Algorithm in Simple Steps,BeITReady, 2015
- Laxmi Publications,The Art of Programming Through Flowcharts & Algorithms (First edition), Anil Bikas Chaudhuri, 2018.
- Kamthane, Ashok N., “Programming in C,” 2/e. Pearson Education India, 2011.
- Sumitabha Das, “Computer Fundamental and C Programming,” McGraw Hill Education, 1st edition.

CO-PO&PSO Correlation

Course Name: Programming with C												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1								3			
CO2:	2	2							3			
CO3:	3								2			
CO4:		2	1			1					1	2
CO5:								2				

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**:**	**B.Tech.**	**Semester**	**:**	**I**
Name of the Course	**:**	**Computer Fundamentals**	**Course Code:**		**COE-B-CSE-23-105**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs / week**
Max Marks	**:**	**50**			

Course Description:

The course will expose the students to basics of computing and it will further help them to understand the workings of a modern computer. Course contents Basics of computer and number representation, various hardware like CPU, Memory, Bus etc. and Operating system, programming languages and their evolution.

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Acquire knowledge about computers and computational problem solving
CO2	Solve computational problems in different number systems.
CO3	Design the solutions of computational problems using iterative and recursive methods using flowcharts and pseudo-codes.
CO4	Analyze the importance of different types of memory and evaluate the impact of different algorithms on memory.
CO5	Understands about system software and features of good programming language.

Syllabus:

Unit-I: Introduction to Computers and its Architecture

Introduction and Characteristics, Computer Architecture, Generations, Classifications, Applications, Central Processing Unit and Memory, Communication between various Units, Processor Speed, Multiprocessor System, Peripheral Buses, Motherboard Demonstration

Unit-II: Computer Arithmetic

Introduction and type of Number System, Conversion between Number System, Arithmetic Operations in different Number System, Signed and Unsigned Number System, Binary addition, binary subtraction, binary multiplication, binary division; Computer codes: BCD, EBCDIC, ASCII, Unicode

Unit-III: Computational Problem Solving

Program Development Cycle, Pseudocode, Flowchart, Representing Information as Bits, Binary System, Storing Integers, Storing Fractions, Examples of Computational Problems, Iterative and

Recursive Approaches to Solve Computational Problems, Easy and Hard Computational Problems

Unit-IV: Memory and Various Input/Output Devices

Introduction to Memory, Input and Output Devices, Memory Hierarchy, Primary Memory and its Types, Secondary Memory, Classification of Secondary Memory, Various Secondary Storage Devices and their Functioning.

Unit-V: Introduction to System Softwares and Programming Languages

Classification of Computer Languages, Introduction of Operating System, Evolution, Type and Function of OS, Unix Commands, Evolution and Classification of programming Language, Feature and Selection of good Programming Language, Development of Program, Algorithm and Flowchart, Program Testing and Debugging, Program Documentation and Paradigms, Characteristics of good Program.

Text Books:

- Introduction to Computer Science", Fourth Impression, Pearson Education, ITL Education Solutions Limited, 2009.
- Pradeep K. Sinha and Priti Sinha, "Computer Fundamentals", eighth edition, BPB Publication
- Raja Raman V., "Fundamental of Computers" (4th edit, Prentice Hall of India, New Delhi.

Reference Books:

- Nell Dale and John Lewis,"Computer Science Illuminated", Jones and Bartlett Publishers.
- Robert Sedgewick and Kevin Wayne, "ComputerScience", Addison-Wesley.

CO-PO & PSO Correlation

Course Name: Computer Fundamentals												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	3	2						2		1	2
CO2:	3	2	3						2		1	2
CO3:	2	2	3						2		1	2
CO4:	1		3						1		1	2
CO5:		2		1					1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme:	**B.Tech.**	**Semester:**	**I**
Name of the Course:	**Communicative English**	**Course Code:**	**SOS-B-HUM-23-106**
Credits:	**2**	**No of Hours:**	**2 Hrs./ Week**
Max Marks:	**50**		

Course Description

This course is formulated to give students a perfect view of communication its scope and importance in business world. It is designed to study principles, elements, and practices of effective business communication. The course focuses on approaches for planning, creating, and transmitting business information within a variety of business situations found in the global perspective. This provides opportunities for improving academic and workplace language proficiency also.

Course Outcomes

After completion of the course students will be able to:

CO Number	Course Outcome
CO1	Know the various elements, media and principles of effective business communication.
CO2	Demonstrate effective business drafting for the various situations.
CO3	Achieve good presentation skills.
CO4	Analyze a problem and devise a solution in a group.
CO5	Communicate business ideas in a public forum and interview.

Syllabus:

Unit I: Introduction to Business Communication & Listening Skill

Basic Forms of Communication, Process of Communication, Principles of Effective Business Communication, 7Cs of Communication, Types of Communication, Barriers of Communication, Verbal & Non-Verbal Communication, Listening, Types of Listening, Barriers to Listening, Overcoming Listening Barriers.

Unit II: Business Letter Writing & Resume Writing

Need, Functions and Kinds of letters, Structure of Letter Writing and Presentation Styles, Quotation Letters, Complaints and Adjustment letters, Sales letters. Resume / CV writing, Report Writing.

Unit III: Presentation Skill
Characteristics of Presentation, Planning, structuring and Delivery of presentation, use of visual aids

Unit IV: Group Communication
Group Communication, Group discussion, Methodology of Group Discussions, Guidelines of Group Discussion, Role Function in Group Discussions, Types of Non- functional Behaviour, Dealing with Abstract topics; Meetings: notice, agenda & minutes of Meeting.

Unit V: Personal Interview
Introduction to Interviews, Types of interviews, Interview questions, Success in an interview, Important non-verbal aspect, Interview- Dos and Don'ts.

Text Books:

1. Meenakshi Raman and Prakash Singh, Business Communication, Oxford University Press.
2. R. C. Sharma and Krishna Mohan, Business Correspondence and Report Writing, Tata McGraw Hill.

Reference Books:

1. A. Bovee, Thill, J. Business Communication Today, Pearson publication, New Delhi.
2. Sanjay Kumar and Pushplata, Communication Skills, New Delhi: Oxford University Press, 2011.

CO-PO Correlation

Course Name: Communicative English												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1				2	1						
CO2:	2	3			3	1						
CO3:			2		3	2		1				
CO4:	2			1			2					
CO5:		2	2		2	2	2	1				

Note: 1: Low 2.: Moderate 3: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Program:	**B.Tech.**	**Semester :**	**I**
Name of the Course :	**Environmental Science**	**Course Code:**	**SOE-B-CIV-23-107**
Credits :	**2**	**No of Hours :**	**2 Hrs/Week**
Max Marks :	**50**		

Course Description:

The course will empower the undergraduate students by helping them to Gain in-depth knowledge of natural processes and resources that sustain life. Develop critical thinking for shaping strategies for environmental protection, conservation of biodiversity, environmental equity, and sustainable development. Acquire values and attitudes towards understanding complex environmental-economic-social challenges and active participation in solving current environmental problems and preventing future ones. Adopt sustainability as a practice in life, society, and industry.

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Gain in-depth knowledge of natural processes and resources that sustain life.
CO2	Develop critical thinking for shaping strategies for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
CO3	Adopt sustainability as a practice in life, society, and industry.

Syllabus:

Unit-I: Ecology, Environment & Natural Resources

Ecology, Environment & Ecosystem, Bio-diversity: Concept, Importance, and Threats & Conservation, Environmental degradation and its causes; Natural resources, Renewable and Non-renewable Resources & associated problems; Green Revolution & Organic farming, Population Forecasting.

Unit-II: Water and Wastewater Pollution

Point & non-point source; Water pollutants & types, sources, and effects; Water Quality measurement, Coagulant, Dissolved Oxygen, BOD & COD; Water & Wastewater Management, Primary, Secondary & Tertiary stages: Objective, Process overview and Equipment used. Solid Waste Management: Objective, Process & Disposal Techniques.

Unit-III: Unit III: Air Pollution

Classification of air pollutants, sources and effects of CO, SOx, NOx, Hydrocarbons, PM, Acid Rain, Ozone, Photochemical Smog & Peroxy Actyl Nitrate (PAN). Earth's energy balance, Green House Effect, Global warming; Lapse rate & Temperature Inversion; Ambient Air Quality Standard; Air pollution Control Techniques for Gaseous and Particulate air pollutants & equipment used.

Unit-IV: Sustainability and Technology-Driven Solution

Application of Artificial Intelligence and Machine Learning in Agriculture, Smart Farming Technology: Controlled Environment Farming, Hydroponics, Aeroponics; Chemical farming vs Sustainable Natural Farming, Bio-Fertilizer; Develop a smart sustainable technology-driven Project.

Text Books:

1. Joseph, K. & Nagendran, R., "Essentials of Environmental Studies", 1st Edition, Pearson Education, 2004.
2. Dey, A. K., "Environmental Chemistry" New Age International Publishers.
3. Srivastava, S., "Environment & Ecology" S.K. Kataria & Sons, New Delhi.

Reference Books:

1. Keerthinarayana & Yesudian, D., "Environmental Science and Engineering", 1st Edition, Hi-Tech publications, 2004.
2. Bharucha, E., "A Text Book for Environmental Studies", Text Book of University Grants Commission, 2004.
3. Peavy, H.S. et. al., "Environmental Engineering", New York: Mc Graw Hill, 1987.
4. Metcalf & Eddy, "Wastewater Engineering: Treatment and Reuse", New Delhi, Tata McGraw Hill, 2003.
5. Principles of Environmental Science Inquiry & Applications by W.P. Cunningham & Mary Ann Cunningham (Tata Mc Graw Hill Publishing Company Ltd.).

CO-PO & PSO Correlation

Course Name:												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:												
CO2:												
CO3:												

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme:	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Basic Electrical and Electronics Engineering Lab**	**Course Code:**	**SOE-B-EE-23-108**
Credits :	**1**	**No of Hours :**	**2 Hrs/Week**
Max Marks:	**50**		

Course Description:

The response of Electrical Circuit can be verified practically by applying different theorems and fundamental techniques. The students will become sure that the theoretical tricks which they have learned from books are true. The students will become competent in the field of circuit analysis

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Understand the basic circuit concepts and verification of network theorems.
CO2	Understand the application of different tools and electrical meters
CO3	The knowledge about the component of electronic and electrical circuit.

The following concepts will be covered in the lab:

- Study of Electrical Safety precautions.
- Study of CRO, DSO, Function Generator, Multimeter, Power supply.
- To verify KCL and KVL.
- To verify Thevenin's and Norton's Theorem.
- To verify Superposition Theorem.
- Determine resonant frequency of series R-L-C circuit.
- To measure Current, Power, Voltage and Power Factor of series R-L-C Circuit.
- To measure the armature and field resistance using Ohm's law.
- Determine the VI Characteristics of PN junction Diode
- Design and study the characteristics of Common Emitter configuration of NPN transistor
- Design and Study the characteristics of Common Collector Configuration of NPN transistor
- Study Different logic gates and verify their truth table.

Reference Books & Manuals:

- Basic Practical in Electrical Engineering: P. S. Dhogal (Author), Standard Publishers Distributors (2004).

Equipment's/Machine/Software required

- Different types of meters, resistors, DC supply, variance, transformers, rheostat. Some experiments can be done by MATLAB.

CO-PO & PSO Correlation:

Course Name: Basic Electrical and Electronics Engineering Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	2	2			2						
CO2:	3	3	2									
CO3:	3	3	3									

Note :1: Low, 2: Moderate, 3: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**:**	**B.Tech.**	**Semester :**	**I**
Name of the Course:		**Basic Computation Skills Lab**	**Course Code:**	**SOE-B-CSE-23-109**
Credits	**:**	**1**	**No of Hours :**	**2 Hrs/Week**
Max Marks	**:**	**50**		

Course Descriptions:

This course offers lecture, laboratory, and case studies to impart teaching and learning to develop problem solving approaches to systematic represent identified problem into design using flowcharts, algorithms and pseudocode leading towards programming through systemic refinements. This course focus on fundamental concepts of elementary c programming including Arrays, Strings, Pointers, Functions, Structures, Unions, Enum, Storage classes, Dynamic memory allocation and File Handling

Course Outcomes:

At the end of the course, a student will be able to:

CO Number	Course Outcome
CO1	Write, debug, resolve syntax & logical errors and execute the programs.
CO2	Make the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
CO3	Use the concepts of functions and dynamic memory allocations for better and cleaner programs
CO4	Develop programs using various features like control statements, Functions, Arrays Strings, File, Pointer, Structure etc.

The following concepts will be covered in the lab:

- Structure of c program, character set, identifiers and keywords, data types, Constants, variables and development environment.
- Operator and expressions, decision making (if , if else , nested if else , switch case ,Break and continue etc .)
- Iterative construct (for, while, do-while), Arrays and Strings.

- Functions, User defined functions, build-in/library functions, Recursion, pointers, header files.
- Structures, unions, enum, Storage classes, dynamic memory allocation, file management.

Text Books:

- Herbert Schildt, C: The Complete Reference, Fourth Edition, McGraw Hill Education, 2017.
- E Balagurusamy, Programming in ANSI C, 8/e, McGraw-Hill India, 2019.
- A. B. Chaudhuri, Flowchart and Algorithm Basics: The Art of Programming, Mercury Learning & Information, 2020.

CO-PO&PSO Correlation

Course Name: Programming with C												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1								3			
CO2:	2	2							3			
CO3:	3								2			
CO4:		2	1			1					1	2
CO5:								2				

- **Note:**1: Low 2.: Moderate 3: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**: B.Tech.**	**Semester**	**: I**
Name of the Course	**: Digital System Design Lab**	**Course Code:**	**SOE-B-CSE-23-110**
Credits	**: 1**	**No of Hours**	**: 2 Hrs/Week**
Max Marks	**: 50**		

Course Descriptions:

This laboratory will enable the undergraduate students to learn the basic concepts and techniques in digital electronic circuits and systems. This laboratory also provides adequate introduction to both combinatorial and sequential logic circuits, such as, adders, subtractors, comparator, multiplexer/demultiplexer, encoders/decoders, 7-segment display and decoder/driver, flip-flop, register, counter, etc. and various combinations of these.

Course Outcomes:

At the end of the course, a student will be able to:

CO Number	Course Outcome
CO1	Understand the basics of any digital systems such as logic gates, Boolean logic simplification, Flip Flops.
CO2	Analyze and design combinational circuits using basic concepts of Digital Electronics.
CO3	Analyze and design sequential circuits using basic concepts of Digital Electronics.
CO4	Perform simple course projects using above design techniques.

The following concepts will be covered in the lab:

Familiarization with basic gates and implementation by universal NAND and NOR.

- Odd and Even Parity generator and checker, binary to gray and gray to binary converters.
- Implementation of Half Adder, Full Adder, Half Subtractor and Full Subtractor circuits.
- Implementation of Ripple carry adder and Carry look ahead adder.
- Implement and verify 3x8 Decoder, Binary to 7-segment Decoder.

- Design and verify Multiplexer and Demultiplexer circuits.
- Design and verify S-R, J-K and D Latch and Flip-Flop using logic gates.
- Design and verify Left and Right Shift Registers.
- Design and verify 4-bit asynchronous up/down counters.
- Design and verify 4-bit synchronous up/down counters.

Text Books :

- R.P. Jain, “Modern Digital Electronics”, 3rd Edition, Tata McGraw Hill.
- T.L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson education.
- M. Morris Mano, Michael D. Ciletti, "Digital Design- with an Introduction to the Verilog HDL", 5th Ed, Pearson.

CO-PO & PSO Correlation

Course Name: Digital System Design Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3								2			
CO2:	2	2	2	1						2	2	
CO3:	2	2	2	1						2	2	
CO4:	1	2	2	1								1

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**:**	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Computer Fundamentals Lab**	**Course Code:**	**SOE-B-CSE-23-111**
Credits	**:**	**2**	**No of Hours :**	**4 Hrs/Week**
Max Marks	**:**	**50**		

Course Descriptions:

This course gives exposure on develop working knowledge of Information and Communication Technology to students. This course also introduces how to effectively use and work with Microsoft office tools, office Google Workspace and basics of linux operating system

Course Outcomes:

At the end of the course, a student will be able to:

CO Number	Course Outcome
CO1	Students will be able to understand the basic tools and shortcuts of Microsoft word and excel.
CO2	Students will be able to understand how to format the file.
CO3	Students will be able to design presentations in Microsoft Power Point.
CO4	Students will be able to understand the basic of Linux OS.

The following concepts will be covered in the lab:

Word Processing- MS-Word

Introduction to word processing, Objectives, Features, Creating, Saving and Opening Documents in Word, Interface, Toolbars, Ruler, Menus, Editing, Previewing, Printing, & Formatting a Document, Find & Replace, Using Thesaurus, Using Auto- Multiple Functions, Mail Merge, Handling Graphics, Tables, Table Manipulations, & Charts, Macros.

Worksheet- MS-Excel

Introduction to Worksheet, creating worksheet, entering into worksheet, heading information, data, text, dates, alphanumeric values, Toolbars and Menus, working with single and multiple workbook, working with formulae & cell referencing, Auto sum, Coping formulae, Previewing & Printing worksheet, Graphs and Charts.

MS Power Point
Introduction, Creation of Presentation (Creating a Presentation Using a Template , Creating a Blank Presentation), Entering and Editing Text, Inserting And Deleting Slides in a Presentation, Preparation of Slides, Inserting Word Table or an Excel Worksheet, Adding Clip Art Pictures, Inserting Other Objects, Using hyperlinks, Adding Movie and Sound, Adding Headers and Footers, Presentation of Slides, Choosing a Set Up for Presentation, Printing Slides and Hand-outs, Running a Slide Show, Transition and Slide Timings, Animating a Slide Show

Introduction to Linux OS
Configuration, Setup, Commands – Navigating File System, File Permissions (R/W/X), Access control and super user (sudo) privileges, Scripting basics, Bash Shell : Input, Output, Comparison Operators, File Handling Operators, Functions, Variables, Control Flow, Loops, Arrays

Text Books :

- Susan. H Cooperman, “Professional Office Procedure”, PHI.
- Suresh Basandra,“Computers Today” , Galgotia Publications.
- Bott Ed , “Microsoft Office Inside Out”,2013 edition, PHI.

CO-PO & PSO Correlation

Course Name: Computer Fundamentals Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	3		2					2			
CO2:		1								1	1	
CO3:		3	3		3				2	2	2	
CO4:	2	2							1	1		

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering)

Academic Semester II

Type of Course	Subject Code	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
			L	P	T	PRE** Mid Sem	PRE** TA	ESE*	Total Marks	(L+T+P)
Core Course	SOS-B-MAT-23-201	Engg. Mathematics – 2 (Calculus and Differential Equation)	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-202	Data Structure	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-203	Comp. Organization and Architecture	3	0	0	30	20	50	100	3
Core Course	SOE-B-CSE-23-204	IT Workshop	0	4	0	0	30	20	50	2
Core Course	SOE-B-CSE-23-205	Python Programming	2	0	0	15	10	25	50	2
GE	SOS-B-HUM-23-206	Indian Knowledge System	3	0	0	30	20	50	100	3
SEC	SOM-B-MBA-23-207	Problem Solving & Design Thinking	2	0	0	15	10	25	50	2
Core Course	SOE-B-CSE-23-208	Data Structure Lab	0	2	0	0	30	20	50	1
Core Course	SOE-B-CSE-23-209	Python Programming Lab	0	2	0	0	30	20	50	1
SEC	SOE-B-CSE-23-210	Universal Human Values	--	--	--	--	--	--	--	--
		Total	16	8	0	150	190	310	650	20

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	:	**B. Tech.**	**Semester**	:	**II**
Name of the Course:		**Calculus and Differential Equation**	**Course Code**	:	**SOS-B-MAT-23-201**
Credits	:	**3**	**No of Hours**	:	**3 Hrs/Week**
Max Marks	:	**100**			

Course Description:

Calculus is the examination of continuous change and the rates change occurs. It handles the finding and properties of integrals and derivatives of functions. This is an introductory course consisting of Differential calculus, Partial derivatives, Integral Calculus (Multiple Integrals) and Ordinary Differential Equations

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	apply notion of continuity and differentiability to functions of single and several variables
CO2	apply partial differentiation and find the extremum by using Lagrange multipliers
CO3	apply the notion of a definite integral from a one-dimensional to an n-dimensional space, and be able to describe and evaluate double and triple integrals.
CO4	familiar with the methods of solving ordinary differential equations.
CO5	learn the technique to solve higher order differential equation.

Syllabus:

Unit-I:

Review of single variable calculus: Review of Limit, continuity and differentiability of single variable functions, Indeterminate forms and L'Hospital rule, Mean Value theorem, Maclaurin and Taylor series expansions of functions of one variable.

Unit-II:

Functions of Several variables: Functions of several variables, Limits and continuity, Partial derivatives and differentiability, Linearization and differentials, Chain rule, Gradient vector, Tangent planes, Directional derivatives, Extreme values and saddle points, Lagrange multipliers, Taylor's formula, Partial derivatives with constrained variables.

Unit-III:

Multiple integral: Multiple integral, Double integrals, Change of order of integration, Area and volume by double integral, Double integrals in polar form, Triple integrals in rectangular

coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals.

Unit-IV:
Ordinary Differential Equations: first order differential equations, variable separation method, Homogeneous Method, exact differential equations; reducible to exact form; Linear equation, Equation reducible to linear differential equation.

Unit-V:
Linear differential equations of higher order with constant coefficients, Method of variation of parameters, Cauchy's and Euler's equations

Text Book

- M. D. Weir and J. Hass, "Thomas' Calculus," 12th edition, Pearson.
- G. B. Thomas and R. L. Finney, Calculus and Analytic Geometry, 9th Ed, Pearson.
- B. S. Grewal, Higher "Engineering Mathematics" Khanna Publishers.
- Erwin Kreyszig "Advanced Engineering Mathematics", John Wiley & Sons.

Reference Book

- Huges-Hallett et al, Calculus: Single and Multivariable, 6th edition, John-Wiley & Sons (USA).
- J. Stewart, Multivariable Calculus, Hybrid Edition.
- Edwards and Penney, Multivariable Calculus with matrices, 6th edition.
- Tom M. Apostol, Calculus Vol. II, 2nd edition, Wiley.
- G. F. Simmons and S. G. Krantz, Differential Equations: Theory, Technique and Practice, Tata McGraw-Hill

CO-PO & PSO Correlation

Course Name: Engineering Mathematics - II												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	2	1									
CO2:	1	1	1									
CO3:	1	1										
CO4:	1	2	1									
CO5:	1	1	1									

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**:**	**B.Tech.**	**Semester**	**:**	**II**
Name of the Course	**:**	**Data Structures**	**Course Code:**		**SOE-B-CSE-23-202**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs/Week**
Max Marks	**:**	**100**			

Course Description:

This course emphasizes on logical structure of data, it's physical representation and techniques for program development and debugging. In this course, students will also learn how to select best suited data structure to solve a particular problem. This course is also about the computational complexities of different data structures.

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.
CO2	To be able to carry out the analysis of Time and Space Complexity of different ADT.
CO3	Ability to assess efficiency trade-offs among different data structure implementations or combinations
CO4	To learn how the choice of data structures and algorithm design methods impacts the performance of programs.
CO5	Understand the data structure and its applications in context of the real world scenarios.

Syllabus:

Unit-I: Introduction

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh; Abstract Data Types (ADT): Time-Space trade-off, - Average, best and worst case analysis, Simple recurrence relations and use in algorithms, Sorting and Searching algorithms.

Unit-II: Linear Data Structure

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays. **Linked lists:** Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal. **Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack. **Queues:** Array and Linked Representation and Implementation of Queues,

Operations on Queue: Create, Add, Delete, Full and Empty; Circular Queues, D-queues and Priority Queues.

Unit-III: Non-Linear Data Structure:
Trees: Basic Terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary Trees, Traversing Binary Trees, Threaded Binary Trees, Traversing Threaded Binary Trees, Huffman Algorithm, Binary Search Tree (BST), Insertion and Deletion in BST, Path Length, AVL Trees, B-trees.

Unit-IV: Nonlinear Data Structure: Graphs
Terminology & Representations, Graphs & Multi-Graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees

Unit–V: Hashing
Searching and Hashing: Sequential Search, Binary Search, Comparison and Analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Text books:

- Alfred. V. Aho, John. E. Hopcroft, Jeffrey.D. Ullman, "Data Structures and Algorithms", Addison-Wesley Publications.,1985.
- Horowitz and Sahani, “Fundamentals of data Structures”, Galgotia Publication Pvt. Ltd., N Delhi.
- Rakesh Nayak, “Data Structures and Algorithms”, Wiley, Dream Tech press,2019.

Reference books:

- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, Asia.1994.
- Jean-Paul Tremblay, Paul. G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill second edition, 1991.
- Thomas. H. Cormen, Charles. E. Leiserson, Ronald. L. Rivest, "Introduction to Algorithms", PHI 1998.
- Lipschutz; Data structure (Schaum); TMH
- R. Kruse et al, “Data Structures and Program Design in C”, Pearson Education Asia, Delhi-2002.

CO-PO & PSO Correlation

Course Name: Data Structure												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	3	2	1	3				1	2		
CO2:	2	2	2	1	3				1	2		
CO3:	3	3	2	2	3				1	3		
CO4:	2	2	1	1	3				1	2		
CO5:	3	3	2	2	3				1	3		

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**:**	**B.Tech.**	**Semester**	**:**	**II**
Name of the Course	**:**	**Computer Organization Architecture**	**Course Code:**		**SOE-B-CSE-23-203**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs/Week**
Max Marks	**:**	**100**			

Course Description:

This course introduces the students to the fundamental concepts of digital computer organization, design and architecture. It aims to develop a basic understanding of the building blocks of the computer system and highlights how these blocks are organized together to architect a digital computer system.

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Demonstrate the organization and working of computer hardware, software and instruction set.
CO2	Analyze and evaluate the performance of various building blocks and Instruction set.
CO3	Acquire comprehensive knowledge and skills in data transfer modes, interrupt structures, I/O interface design, DMA, and bus architectures.
CO4	Understand memory organization, mapping methods, and interleaving techniques for effective data management.
CO5	Comprehending and applying pipelining, interconnection, and data flow concepts to advance processor design and parallel computing.

Syllabus:

Unit - I Computer Basics and CPU:

Von Newman model, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formats and addressing modes of basic computer.

Unit - II Control Unit Organization:

Hardwired control unit, Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer. Arithmetic and Logic Unit: Arithmetic Processor, Addition, subtraction, multiplication and division.

Unit - III Input Output Organization:

Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor, Data transfer,

DMA. Buses: connecting I/O devices to processor and memory, interfacing I/O devices to memory, processor, and operating system.

Unit - IV Memory organization:
Memory Hierarchy, Memory Mapping, Associative memory, Main memory, Virtual memory, Memory Management Hardware, Memory Interleaving.

Unit - V Pipelining and Multiprocessors:
Basic concepts of pipelining, Linear pipeline processor, Non linear pipeline processor, Instruction and arithmetic pipeline design, Classification of Processors, Interconnection structure and inter-processor communication, Interconnection Networks, Data Flow Machines.

Text Books:

- Computer System Architecture, Morris Mano, PHI.
- Structured Computer Organization, Tanenbaum, Pearson Education.
- Advanced Computer Architecture with Parallel Programming, K. Hwang, MGH.

Reference Books:

- Computer Organization and Architecture, William Stallings, PHI
- Computer Organization, Carl Hamacher, TMH.
- Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy, Elsevier.

CO-PO & PSO Correlation

Course Name: **Computer Organization Architecture**												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	1	1	1	1	2	1	1	3	2	2	2
CO2:	3	1	2	2	1	2	1	1	2	3	2	2
CO3:	3	1	1	1	1	2	1	1	2	2	2	2
CO4:	2	1	2	2	1	2	1	1	3	2	1	2
CO5:	2	1	2	2	1	2	1	1	3	2	2	2

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**IT Workshop**	**Course Code:**	**SOE-B-CSE-23-204**
Credits :	**2**	**No of Hours :**	**4 Hrs/Week**
Max Marks :	**50**		

Course Descriptions: :

This course will provide student a much-needed knowledge of computer hardware and networking, enabling them to identify and rectify the onboard computer hardware, software and network related problems. With the help of this course the student will be able to understand the hardware specifications that are required to run operating system and various application programs. The course will also include training on Internet & World Wide Web and Productivity tools.

Course Outcomes:

At the end of the course, a student will be able to:

CO Number	Course Outcome
CO1	Understand the basic concept and structure of computer hardware and networking.
CO2	Apply their knowledge about computer peripherals to identify/rectify problems onboard.
CO3	Integrate the PCs into local area network and re-install operating system and various application programs.
CO4	Manage data backup and restore operations on computer and update application software.

The following concepts will be covered in the lab:

- Assembly of Computer: Introduction to hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Working of SMPS. Study of various ports. Steps and precautions to assemble computer.
- Assembly of Laptop, Laptop hardware peripherals like RAM, ROM, keyboard, Mouse, processors, etc. Generation of processors. Study of various ports. Steps and precautions to assemble laptop.
- Computer Network Tools: Introduction to computer network. Study of various topologies. Preparing the network cable using crimping tools and connectors. Study of various network environments
- Operating System and Software Installations: Introduction to operating system. Types of operating system (Windows and Linux).

- Window:- Evolution of operating system, Introduction to software. Types of software (MS office, VLC media player, Win rar), etc. Linux:- Evolution of operating system. Introduction to software. Types of software (open office, web browser, etc.)
- Internet: Introduction and evolution of internet. Study of various internet-based services like email, social network, chat, etc. Introduction to cyber security and cyber laws.
- Server: Introduction to server. Difference between server and normal desktop. Evolution of servers. Study of various servers like email, data, domain, etc

Text Books :

- Hardware and Software of Personal Computers - Sanjay K. Bose.
- Fundamentals of Computers by V. Rajaraman.
- Computer Studies - A first course - John Shelley and Roger Hunt
- Computer Fundamentals, MS Office and Internet & Web
- Technology - Dinesh Maidasani.
- Modern Computer Hardware Course - M Lotia, P Nair, P Lotia.

CO-PO & PSO Correlation

Course Name: IT Workshop												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:		2				1			2	1	1	1
CO2:	1	2				2			1		2	1
CO3:		2				1			2		1	1
CO4:		2				1			2		1	1

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme:	**B.Tech.**	**Semester:**	**II**
Name of the Course:	**Python Programming**	**Course Code:**	**SOE-B-CSE-23-205**
Credits:	**2**	**No of Hours:**	**2 Hrs./ Week**
Max Marks:	**50**		

Course Description:

Python is a next generation multi-purpose programming language that allows different users to create applications of various domains. Students will be able to learn primary fundamentals of python programming and the potential of python is to achieve modern computing requirements.

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Apply python for problem solving
CO2	Understand the concept of decision and loop control.
CO3	Perform operations with basic data types.
CO4	Handle the file and exceptions.
CO5	Understand the concepts of python classes and packages.

Syllabus:

Unit-I:

Introduction: History, Variables, Keywords, Basic Operators, Naming Conventions, Understanding python blocks. Data Types, Declaring and using Numeric data types: int, float etc., Executing code from the Command Line.

Unit-II:

Flow Control Conditional blocks: if, else, simple for loops, for loop using ranges, string, list and dictionaries. while loops, loop manipulation using pass, continue, break and else.

Unit-III:

Complex data types: Using string data type and string operations, Defining list and list slicing, Use of tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Functions

Unit-IV:

Exceptional Handling: Errors, Runtime Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, raise, assert. File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations.

Unit-V:
Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism, Packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc.

Text Books:

- Wesley J. Chun, "Core Python Applications Programming".
- Charles Dierbach, "Introduction to Computer Science using Python".
- Rakesh Nayak, "Python for Engineers and Scientists Concepts and Applications", CRC Press.

Reference Books:

1. Mark Lutz, "Learning Python", 5th edition, O'reilly Publication
2. John Zelle, "Python Programming: An Introduction to Computer Science", Second edition, Course Technology Cengage Learning Publications.

CO-PO & PSO Correlation

Course Name: Python Programming												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2		3				2		1	2
CO2			2	-	3				2		1	2
CO3	2			2	3				1		1	2
CO4	3			2	3				1		1	2
CO5				2	3							

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme:	**B.Tech.**	**Semester:**	**II**
Name of the Course:	**Indian Knowledge System**	**Course Code:**	**SOS-B-HUM-23-206**
Credits:	**3**	**No of Hours:**	**3 Hrs./ Week**
Max Marks:	**100**		

Course Description:

India has a rich tradition of intellectual inquiry and textual heritage that goes back several thousands of years. India was advanced in knowledge systems, traditions, and practices since antiquity. The whole range of knowledge systems is multifarious, from the Vedas, and Upanishads to scriptural, philosophical, scientific, technological and artistic sources. The disciplines and domains of knowledge include logic, philosophy, language, technology and crafts, polity, economics and governance, ethics and sociological orders, architecture and engineering, pure sciences, earth sciences, bio sciences, poetics and aesthetics, law and justice, grammar, mathematics and astronomy, metrics, agriculture, mining, metallurgy, trade and commerce, Ayurveda and Yoga, medicine and life sciences, geography, military science, weaponry, ship building, navigation and maritime traditions, biology and veterinary science, etc. The major knowledge tradition prescribes 14 Vidyas- theoretical domains – and 64 Kalas - crafts, skill sets and arts – that are useful in day-to-day living.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the rich heritage of society, state and polity in ancient India
CO2	Acquire knowledge about Indian literature, culture, tradition and practices
CO3	Inculcate an understanding of Indian religion, philosophy, and practices
CO4	Understand, analyze and apply the ancient science, management and Indian knowledge system.
CO5	Acquire knowledge of Indian cultural heritage and performing arts

Course Content:

Unit-I: Society, State and Polity in India
State in Ancient India: Evolutionary Theory, Force Theory, Mystical Theory Contract Theory, Stages of State Formation in Ancient India, Kingship , Council of Ministers, Administration, Political Ideals in Ancient India, The Seven Limbs of the State, Society in Ancient India, Purusārtha, Varnāshrama System, Āshrama or the Stages of Life, Marriage, Four-class Classification, Slavery.

Unit-II: Indian Literature, Culture, Tradition and Practices
Evolution of script and languages in India: Harappan Script and Brahmi Script. The Vedas, the Upanishads, the Ramayana and the Mahabharata, Puranas, Buddhist And Jain Literature in Pali, Prakrit And Sanskrit, Kautilya's Arthashastra, Famous Sanskrit Authors, Indian Languages & Literature, Persian And Urdu, Hindi Literature.

Unit-III: Indian Religion, Philosophy and Practices
Pre-Vedic and Vedic Religion, Buddhism, Jainism, Six System Indian Philosophy, Shankaracharya, Various Philosophical Doctrines, Other Heterodox Sects, Bhakti Movement, Sufi movement, Socio religious reform movement of 19th century, Modern religious practices.

Unit-IV: Science, Management and Indian Knowledge System
Astronomy in India, Chemistry in India, Mathematics in India, Physics in India, Agriculture in India, Medicine in India, Metallurgy in India, Geography, Biology, Harappan Technologies, Water Management in India, Textile Technology in India, Writing Technology in India, India's Dominance up to Pre-colonial Times.

Unit-V: Cultural Heritage and Performing Arts
Engineering and Architecture in Ancient India, Sculptures, Seals, coins, Pottery, Puppetry, Dance, Music, Theatre, drama, Painting, Martial Arts Traditions, Fairs and Festivals, Indian Cinema, Indian's Cultural Contribution to the World.

Text Books:

- Cultural Heritage of India-Course Material, V. Sivaramakrishna (Ed.), Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
- Indian Art and Culture, S. Baliyan, Oxford University Press, India
- Romila Thapar, Readings In Early Indian History Oxford University Press , India

Reference Books:

- Modern Physics and Vedant, Swami Jitatmanand, Bharatiya Vidya Bhavan
- The wave of Life, Fritz of Capra
- Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
- Yoga-darshanam with Vyasa Bhashya, GN Jha (Eng. Trans.) Ed. R N Jha, Vidyanidhi Prakasham, Delhi,2016
- The Wonder that was India, Basham, A.L., (34th impression), New Delhi, Rupa & co

- Aspects of Political Ideas and Institutions in Ancient India, Sharma, R.S., Delhi, Motilal Banarsidass,

पाठ्यक्रम: भारतीय ज्ञान प्रणाली

यूनिट-I: **भारत में समाज**, **राज्य और राजनीति**
प्राचीन भारत में राज्य: विकासवादी सिद्धांत, बल सिद्धांत, रहस्यमय सिद्धांत अनुबंध सिद्धांत, प्राचीन भारत में राज्य गठन के चरण, शासन, प्राचीन भारत में मंत्रिपरिषद, प्रशासन, राजनीतिक आदर्श, राज्य के सात अंग, प्राचीन भारत में समाज, पुरुषार्थ, वर्णाश्रम प्रणाली, आश्रम या जीवन के चरण, विवाह, चार वर्ग वर्गीकरण, गुलामी।

यूनिट- II: **भारतीय साहित्य**, **संस्कृति**, **परंपरा और व्यवहार**
भारत में लिपि और भाषाओं का विकास: हड़प्पा लिपि और ब्राह्मी लिपि, वेद, उपनिषद, रामायण और महाभारत, पुराण, पाली, प्राकृत और संस्कृत में बौद्ध और जैन साहित्य, कौटिल्य का अर्थशास्त्र, प्रसिद्ध संस्कृत लेखक, भारतीय भाषाएँ और साहित्य, फ़ारसी और उर्दू, हिंदी साहित्य।

यूनिट-III: **भारतीय धर्म**, **दर्शन और व्यवहार**
पूर्व-वैदिक और वैदिक धर्म, बौद्ध धर्म, जैन धर्म, छह प्रणाली भारतीय दर्शन, शंकराचार्य, विभिन्न दार्शनिक सिद्धांत, अन्य विषम संप्रदाय, भक्ति आंदोलन, सूफी आंदोलन, 19 वीं सदी के सामाजिक धार्मिक सुधार आंदोलन, आधुनिक धार्मिक प्रथाएं।

यूनिट-IV: **विज्ञान**, **प्रबंधन और भारतीय ज्ञान प्रणाली**
भारत में खगोल विज्ञान, भारत में रसायन विज्ञान, भारत में गणित, भारत में भौतिकी, भारत में कृषि, भारत में चिकित्सा, भारत में धातु विज्ञान, भूगोल, जीव विज्ञान, हड़प्पा प्रौद्योगिकी, भारत में जल प्रबंधन, भारत में वस्त्र प्रौद्योगिकी, भारत में लेखन प्रौद्योगिकी, पूर्व-औपनिवेशिक काल तक भारत का प्रभुत्व प्राचीन भारत में व्यापार।

यूनिट-V: **सांस्कृतिक विरासत और प्रदर्शन कला**
प्राचीन भारत में इंजीनियरिंग और वास्तुकला, मूर्तियां, मुहरें, सिक्के, मिट्टी के बर्तन, कठपुतली, नृत्य, संगीत, रंगमंच, नाटक, पेंटिंग, मार्शल आर्ट परंपराएं, मेले और त्यौहार, भारतीय सिनेमा, दुनिया में भारतीय सांस्कृतिक योगदान।

पाठ्य पुस्तकें:

- भारत की सांस्कृतिक विरासत, वी. शिवरामकृष्ण (संपा.), भारतीय विद्या भवन, मुंबई, 5वां संस्करण, 2014
- भारतीय कला और संस्कृति, एस. बालियान, ऑक्सफोर्ड यूनिवर्सिटी प्रेस, भारत
- रोमिला थापर, रीडिंग्स इन अर्ली इंडियन हिस्ट्री, ऑक्सफोर्ड यूनिवर्सिटी प्रेस, इंडिया

संदर्भ ग्रंथ:

- आधुनिक भौतिकी एवं वेदान्त, स्वामी जीतात्मानन्द, भारतीय विद्या भवन
- द वेव ऑफ लाइफ, फ्रिट्ज ऑफ कैपरा
- पतंजलि योग सूत्र, रामकृष्ण मिशन, कोलकाता

- योग दर्शनम विथ व्यास भाष्य, जीएन झा, एड. आर एन झा, विद्यानिधि प्रकाशम, दिल्ली, 2016
- द वंडर दैट वाज़ इंडिया, बाशम, ए.एल., (34वीं छाप), नई दिल्ली, रूपा एंड कंपनी
- आस्पेक्ट्स ऑफ़ पोलिटिकल आइडियाज एंड इंस्टीटूशन्स इन अन्सिएंट इंडिया, शर्मा, आर.एस., दिल्ली, मोतीलाल बनारसीदास,

CO-PO Correlation

Course Name: **Indian Knowledge System**												
	Program Outcomes								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**1**				**1**	**1**	**1**	**1**				
CO2:				**2**	**1**			**1**				
CO3:		**1**		**3**	**1**	**1**		**1**				
CO4:	**1**	**1**		**2**	**1**	**1**	**3**	**1**				
CO5:	**1**		**1**		**2**		**1**	**1**				

Note: 1: Low 2.: Moderate 3: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Program	**:**	**B.Tech.**	**Semester**	**:**	**II**
Name of the Course:		**Problem Solving & Design Thinking**	**Course Code:**		**SOM-B-MBA-23-207**
Credits	**:**	**02**	**No of Hours :**		**2 Hrs/Week**
Max Marks	**:**	**50**			

Course Description:

Design Thinking is about approaching things differently with a strong user orientation and fast iterations with multidisciplinary teams to solve complex problems. Design thinking adopts human empathy approach to identify problems or market needs, and then find solutions through creative brainstorming. Design Thinking is a structured method of developing and delivering products, services and experiences that address the unsaid human needs. The structured approach and the use of empathy to innovate, (re)solves many critical business problems and deliver products and services that delight customers. The importance is increasing with the growth of automation and digitalization, as it focuses on the actual human response to a product or service and identifies how to improve customer satisfaction. Design Thinking equips every professional to understand, solve complex business problems that are difficult to decipher. Professionals with applied skills would provide a positive impact on organizational top line and bottom line by developing low-cost working prototypes for various needs and test them in real time. Design-led Business takes advantage in building higher competitiveness with due focus on values and virtues governed by design thinking using the concepts of systematic vision, concern for human, believe in teamwork, innovative spirit and rational thinking. Design thinking creates a collaborative, interconnected work environment where decisions are made quickly through research, prototyping, and testing. This is a mental skill to produce customer-driven solutions as a business game-changer eventually, especially in times of crisis and transformations, otherwise.

Course Outcomes:

At the end of this course, the student will be able to:

CO Number	Course Outcome
CO1	Understanding the human behaviour towards a product/process/service/system with a user's perspective.
CO2	Analyzing the users' requirement and define the problem.
CO3	Developing ideas and solutions through brainstorming and design iterations to solve the users' problem.
CO4	Applying the ideas to develop a prototype or solution based on the concept and analysis like a sample.
CO5	Evaluating the effectiveness of the prototype or solution through user-centric tests and soliciting satisfactory feedback.

Syllabus:

Unit-I: Empathy

Introduction to Design Thinking as an Art; Need, Expectation and Appreciation; Design Thinking as a Process; Design Thinking vs Traditional Thinking; Design Thinking vs Critical Thinking; Creative Thinking vs Innovative Thinking; Principles of Design Thinking - Human-centricity, Empathy, Collaboration, Ideation, Iteration, Action; Approaches of Design Thinking (User-/Customer-Centric, Entrepreneurial, Innovative Mind-set); Building Innovation Culture; Design Thinking and Innovations for Managing Crisis and Stress; Design Thinking in Professional and Social Life; Examples on Successful Design Thinking.

Unit-II: Define

Lead User Research; Exploring Pain Points; Product Innovation; Designing the problem statement; Sharp key-questions to explore solution; Pitch Design and Communication, Visualization, Storytelling; Plan to address the need (a solution); Confirm users towards the issue with basic trouble.

Unit-III: Idate

Rules of ideation; Generation of ideas; Big ideas; Selection of a (Desirable-Feasible-Viable) idea; Visualization of idea; Brainstorming for Creative Solutions; Right Brain Thinking; Immersive Research: Tool and Techniques, Challenge Framing and Ideation Techniques; Design Thinking as an enabler; Journey mapping; Convergence and Divergence Design Tools, Narrowing of Ideas; and Storytelling for Impactful Delivery.

Unit-IV: Prototype

Transforming ideas into Shapes – Prototypes, Representations; NPD Project; Collaborative Product Development; Miniature of Product; Managing Constraints; Innovation; Recommendation of Test Cycles; Achieving Product Integrity, Demonstration of Prototypes; Redesigning.

Unit-V: Test

Testing of Success for the Prototype; Refine and Redesign a Prototype; Creating Primary Demand; Concept Development; Product innovation; Confirm with the End-user; Cyclical and Iterative tracking and Testing.

Text Book:

- Change by Design, Tim Brown & Barry Katz, Harper Collins e-Books.

Reference Books:

- Hidden in Plain Sight by Jan Chipchase,
- The Moment of Clarity and Sense-making by Christian Madsbjerg,
- Design Thinking for Strategic Innovation by Idris Mootee.

CO-PO & PSO Correlation

Course Name: Problem Solving & Design Thinking												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	2	3	1	2	2	1	2	2	3	3	2
CO2:	2	2	3	1	2	2	1	2	2	3	3	3
CO3:	2	3	3	1	2	2	1	3	2	3	2	2
CO4:	2	3	3	1	3	2	2	3	2	3	3	2
CO5:	2	2	3	2	2	2	2	2	2	3	3	3

Note: 1: Low 2: Moderate 3: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme :	**B.Tech.**	**Semester:**	**II**
Name of the Course:	**Data Structure Lab**	**Course Code:**	**SOE-B-CSE-23-208**
Credits :	**1**	**No of Hours:**	**2 Hrs/Week**
Max Marks :	**50**		

Course Descriptions:

This lab provides hands-on experience in implementing and analyzing data structures and algorithms. Students gain proficiency in programming, problem-solving, and performance analysis. They design efficient data structures for real-world problems and develop collaboration and documentation skills. Prepares students for advanced data structure concepts.

Course Outcomes:

At the end of the course, a student will be able to:

CO Number	Course Outcome
CO1	Ability to select the data structures that efficiently model the information in a problem.
CO2	Ability to assess efficiency trade-offs among different data structure implementations or combinations.
CO3	Implement and know the application of algorithms for sorting and pattern matching.
CO4	Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

The following concepts will be covered in the lab:

- Time Complexity Analysis
- Linked List Operations
- Stack and Queue Implementations
- Binary Search Tree Operations
- AVL Tree Implementation
- Graph Traversal Algorithms
- Minimum Spanning Tree Algorithms
- Hash Table Implementation
- Huffman Encoding
- B-Tree Operations

Text Books :

- Data Structures Using C and C++ by Langsam, Tanenbaum, Prentice Hall India Learning Private Limited; 2 editions.
- Data Structures, Schaum's Outlines Series, by Seymour Lipschutz
- Fundamentals of Data Structures in C, by Sahni Horowitz, Publisher: Universities Press; Second edition.

CO-PO & PSO Correlation

Course Name: Data Structure Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	3	2	1					1	2		
CO2:	2	2	2	1					1	2		
CO3:	3	3	2	2					1	3		
CO4:	2	2	1	1					1	2		

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Python Programming Lab**	**Course Code:**	**SOE-B-CSE-23-209**
Credits:	**1**	**No of Hours :**	**2 Hrs./week**
Max Marks:	**50**		

Course Descriptions:

This course introduces the basic concepts of procedural and object-oriented programming using python programming language. This course also provides practical knowledge and hands-on experience in designing and implementing data structures. Activities covered include introduction to python programming language, datatypes, operators, loop structures, decision-making statements, fundamental data structures, functions, Classes and Objects, Constructor, File Handling, Exception Handling and Numpy module.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Distinguish between procedural, object-oriented and functional programming paradigm using python programming language.
CO2	Use basic data structures like list, string, tuple, set and dictionary in python.
CO3	Implement various functional programming concepts like class, functions, mutable and immutable data, and recursion.
CO4	Utilize standard Python packages to develop software applications.

The following concepts will be covered in the lab:

- Python environment by implement basic python programs.
- To implement simple statements and basic mathematical expressions.
- Use of existing operators with basic and advanced mathematical calculation using conditional statements.
- Looping-based problems such as prime number, Fibonacci and factorial programs, etc. by using looping conditions.
- Implementing real-time/technical applications using Lists, Tuples.

- Implement real life/ scientific/ technical problems using Sets and Dictionaries.
- Implement real life/ scientific/ technical problems using text strings and functions.
- Understand the data communication during compile/run time using the concept of file handling
- Understand the concept of exception handling in file handing.
- Explore various existing standard python libraries.

Text Books

- Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
- Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

Reference Books

- Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
- G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
- John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data‘‘, Third Edition, MIT Press, 2021

CO-PO & PSO Correlation

Course Name: Programming Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	-	3	2	2	-	-	-	-	-	-	-
CO2:	3	-	-	2	2	-	-	-	-	-	-	2
CO3:	3	-	-	2	2	-	-	-	-	-	-	2
CO4	-	-	-	3	3	-	-	-	-	-	-	2

Note: 1: Low 2.: Moderate 3: High