SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

OP JINDAL UNIVERSITY

Raigarh-Chhattisgarh

Scheme and Syllabus

Of

B. Tech. (01UG020)

Department of

Computer Science and Engineering

School of Engineering

Batch 2023-2027

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 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

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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

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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

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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

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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

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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:

- Mark Lutz, "Learning Python", 5th edition, O'reilly Publication
- 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

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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