SEM I

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7MA206
Course Name	Discrete Mathematics
Desired Requisites:	General curiosity, maturity expected from adult student.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	ISE	MSE	ESE	Total
Tutorial		20	30	50	100
		Credits: 3			

Course Objectives

1	To impart logical thinking and its application to computer science.
2	To inculcate ability to reason and ability to present a coherent and mathematically correct argument.
3	To present the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Articulate fundamental concepts such as sets, relations, functions, logic, and proof techniques.	II	Understanding
CO2	Adapt problem-solving skills using mathematical reasoning and logical thinking to solve problems related to discrete structures.	III	Applying
CO3	Maximize proficiency in algorithmic thinking and apply algorithms to solve problems involving graphs, trees, and networks.	IV	Analyzing
CO4	Checking combinatorial principles, counting techniques, permutations, combinations, and their applications.	V	Evaluating

Module	Module Contents	Hours
I	**Logic:** Proposition and Predicate Logic, introduction to proof techniques. Advanced proof techniques, resolution, induction	6
II	**Set Theory:** Definitions and notation, Set operations, Venn diagrams, Cartesian products and power sets, Cardinality theory, countable and uncountable sets, Cantors diagonalization, multisets.	6
III	**Relations and Functions:** Relations and Their Properties: Definitions and examples, Representing Relations: Matrices of relationss, Directed graphs. Properties of relations: Equivalence relations and partitions, Partial orderings	7
IV	**Combinatorics:** The rule of sum and the rule of product, Permutations and combinations, Pigeonhole principle, Inclusion-exclusion principle, recurrence relations, generating functions.	6

V	**Graph and Trees:** Graph Theory: Definitions and basic concepts, Types of graphs, Graph isomorphism, Connectivity in graphs. Graph Algorithms: Euler and Hamiltonian paths, Planar graphs and graph coloring. Graph as Trees: Introduction to Trees, Definitions and properties, Rooted trees, Tree traversal algorithms, Spanning trees, Applications of Trees, Binary search trees.	7
VI	**Abstract Algebra:** Introduction, Groups, Subgroups, Generators and Evaluation of Powers, Permutation Groups, Lattices and Algebraic Systems, Basic Properties of Algebraic System Defined by Lattices, Distributive and Complemented Lattices.	6

Textbooks	
1	C. L. Liu, D P Mohapatra, "Elements of Discrete Mathematics: A Computer Oriented Approach", TMG, 3rd Edition, 2011.
2	Kenneth H. Rosen," Discrete Mathematics and Its Application", TMG, 7th Edition, 2011
3	J.P. Tremblay &R. Manohar,"Discrete Mathematical structure with applications to computer",TMG, 1st Edition, 1997.

References	
1	K.D. Joshi, "Foundation of Discrete Mathematics", 2019
2	Lipschutz, Marc Lipson ,"Discrete mathematics", Schaum'soutline series,3rd Edition, 2007

Useful Links	
1	https://nptel.ac.in/courses/106106183
2	https://nptel.ac.in/courses/106108227

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3											1	1	
CO2	2	3		1								2		1
CO3		2		2								1	1	
CO4	3	2	2	1										1

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem III/IV
Course Code	7IT201
Course Name	Data Structures
Desired Requisites:	Programming in C including pointers and File Handling

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
		Credits: 3			

Course Objectives

1	To use specific data structures for algorithm
2	To describe use of recursion in program development
3	To explain linear, non-linear data structures and algorithms

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Describe the fundamental concepts of data structure using dynamic memory allocation	II	Understanding
CO2	Recite use of linear and non-linear data structures like link list and trees	III	Applying
CO3	Identify need of recursion and solve various recursive problem	IV	Analyzing
CO4	Compare various searching and sorting techniques to analyse performance of algorithms	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Introduction:** Basic Concepts: Algorithm, Pseudo-code, ADT, Data Structure, Algorithmic Efficiency, And Recursion, Dynamic Memory allocation, Introduction of Pointers to Arrays ,functions and Structures.	5
II	**Linked Lists:** Concept of linked organization, Singly linked list, doubly linked list and dynamic storage management, circular linked list, Operations such as insertion, deletion, inversion, concatenation, computation of length, traversal on linked list, Representation and manipulations of polynomials using linked lists	7
III	**Stacks and Queues:** Fundamentals stack and queue as ADT, Representation and Implementation of stack and queue using linked organization, Circular queue: representation and implementation, Application of stack for expression evaluation and for expression conversion, Backtracking, Stacks and Recursion, Priority queue Doubly Ended Queue.	7
IV	**Trees:** Basic terminology, binary trees and its representation, binary tree traversals (recursive and nonrecursive), operations such as copy, equal on binary tree, expression trees, General Trees, Binary Search Trees, Heaps and its operations. B-Tree – B+ Tree	7

V	**Graphs:** Terminology and Representation of graphs using adjacency matrix, adjacency list and adjacency Multi-list, Traversals Depth First and Breadth First, Minimum Spanning Tree	6
VI	**Searching & Sorting Technique:** **Search:** Importance of searching, Sequential, Binary, Fibonacci search algorithms, Sorting: Internal and External Sorts, Insertion, Shell, Heap, Quick sort, Merge sort, Radix sort, Two-way merge sort **Hashing:** Hashing functions, overflow handling with and without chaining, open addressing: linear, quadratic, double, rehashing, Indexing Techniques: hashed indexes, File Handling.	8

Textbooks	
1	Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures, A Pseudocode Approach With C", Cengage Learning, 2nd Edition, 2007
2	S. Lipschutz, "Data Structures with C", Schaum's Outlines Series, Tata McGraw-Hill, 2nd edition, 2017
3	Narsimha Karumanchi "Data Structure and algorithms", Careermonk 5th edition, 2011

References	
1	Yashavant Kanetkar, "Understanding pointers in C", 6th edition, BPB Publication, 2019

Useful Links	
1	https://nptel.ac.in/courses/106/102/106102064/
2	https://archive.nptel.ac.in/courses/106/106/106106127/

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		2	1										2
CO2		3											3	
CO3	2	2	1	2									2	
CO4	3	1		3										2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7IT202
Course Name	Computer Networks
Desired Requisites:	Data Communication and Networking

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
		Credits: 2			

Course Objectives

1	Describe fundamental concepts of computer networking
2	Introduce various services provided by TCP/IP model
3	Acquaint with different protocols of TCP/IP and OSI model

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Discuss functioning of various networking components for local and wide area network	II	Understanding
CO2	Illustrate physical, logical and service point addressing system using IPv4 and IPv6	III	Applying
CO3	Explain port and service point mechanism using sockets	IV	Analyzing
CO4	Compare different protocols of TCP/IP model for various applications	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Data link layer** Analog and Digital Data Transmission. Wired and Wireless Transmissions, Frame structure, error control, flow control, Multiple Access Protocols- CSMA, CSMA/CD, Ethernet Cabling.	4
II	**Network Layer** Network Layer Design issues- Packet Switching, Services to transport layer, Routing- Static & Dynamic routing, flooding, Fragmentation. Congestion Control Algorithms.	4
III	**The Network Layer in the Internet** Addressing, Internet Control Protocols- SPF, BGP, IP operations, Sub-netting, Super-netting, IPv4, IPv6.	5
IV	**Transport Layer** Elements of transport protocol- TCP segment header, TCP Port, Socket Programing, TCP connection establishment, release, flow control, buffering and multiplexing. UDP, RPC, RTP, service points and sockets.	5
V	**Application Layer** DNS—The Domain Name System-name space, resource records, name servers. Electronic Mail- architecture and service, user agent, message format and transfer final delivery.	4

VI	**Application Layer Protocols** The World Wide Web-architecture overview, Application layer protocol: HTTP, FTP, SMTP, Case study: Campus Network.	4
Textbooks		
1	Larry Peterson and Bruce Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann, 6th Edition, October 2020	
2	Behrouz A. Forouzan, "Data Communication and Networking" TMGH 4th edition., 2013	
References		
1	James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 7th Edition, Pearson Publication, 2016	
Useful Links		
1	https://nptel.ac.in/courses/106105183	
2	https://archive.nptel.ac.in/courses/106/105/106105081/	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1											2	
CO2	2	3	1											2
CO3	2		3										2	
CO4	3	2		2									3	

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	B. Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7IT203
Course Name	Computer Architecture & Microprocessor
Desired Requisites:	Digital Electronics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
		Credits: 3			

Course Objectives

1	To Provide fundamental knowledge of processors architecture & the memory organization
2	To Instruct the basic concepts of execution speedup by pipelining
3	To demonstrate the basic building blocks and operations of 16/32/64 bit microprocessors & concept of multiple processor systems
4	To inculcate the ability to design assembly language programs.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Discuss the design issues in computer architecture for concurrent execution of instruction set	II	Understanding
CO2	Apply memory management techniques for efficient computation	III	Applying
CO3	Estimate the performance metrics for computer architecture with pipelining	IV	Analysing
CO4	Utilize the architecture and organization of microprocessors with instruction set to design assembly language programs	VI	Creating

Module	**Module Contents**	**Hours**
I	**Arithmetic & Control Design** Encoding of machine instructions. Design of signed multiplication, Booth's algorithm, bit-pair recording, division, floating point numbers and operations, guard bits and rounding. Execution of a complete instruction, sequencing of control signals, micro programmed control, microinstruction format	7
II	**Memory** Computer memory organization, RAM, ReadOnly memories, cache memories, mapping functions, replacement algorithms, performance consideration: Multimodal memories & interleaving, hit rate & miss penalty, multilevel cache organization, virtual memories, address translation, memory management requirement	6
III	**Pipelining** Basic concepts in pipelining, data hazards, instruction hazards, control hazards, influence of pipelining on instruction set, data-path & control considerations, performance considerations, and Flyn's classification of computer architectures.	6

IV	**Introduction to 8086(16 bit):** Functional & architectural comparison of 8085 & 8086, programming, implementing standard programming structures in 8086, string, procedure & macros	5
V	**Introduction to 80386(32 bit):** Features & architecture of 80836, Pin description, 80836 register set, special 80386 registers, 80386 Real mode memory segmentation, data types used in real mode, instruction format, addressing modes of 80386. Introduction to Intel Core2 (64 bit) microprocessor	6
V	**Programming techniques & interfacing:** Writing assembly language programs, debugging, looping, counting, indexing, arithmetic operations related to memory, counters & delays, stacks, Interrupts, I/O (USB) interface, data communication.	7

Textbooks	
1	J. Hayes , "Computer Architecture and Organization", McGraw Hill, 3rd Edition, 2017
2	C. Hamacher et. al, "Computer Organization", 5th Edition, 2010`
3	M. Morris Mano & Michael D. Ciletti,"Digital Design", Pearson Prentice Hall Publication, 4th Edition, 2008
4	A K Ray & K M Bhurchandi, "Advanced Microprocessors & Peripherals", Second Edition, Tata McGraw-Hill education private limited, 2012.

References	
1	D. Patterson, Morgan Kaufmann "Computer Architecture", 6th Edition, 2017
2	Floyd & Jain, "Digital fundamentals", Pearson education, Eighth Edition, 2007.
3	James Turley, "Advanced 80386 Programming Techniques", Tata McGraw-Hill, Second Edition, 2005.

Useful Links	
1	https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials
2	https://nptel.ac.in/courses/106/108/106108100/2
3	https://nptel.ac.in/courses/108/107/108107029/3
4	https://nptel.ac.in/courses/108/105/108105102/

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2											
CO2		1	3		2								1	
CO3	2	2		3									2	3
CO4	3		3		2									2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem III/IV
Course Code	7IT251
Course Name	Data Structures Lab
Desired Requisites:	Programming in C including pointers

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
	-	30	30	40	100
		Credits: 1			

Course Objectives

1	To demonstrate various operations on linear and non-linear data structures
2	To use and compare sorting and searching algorithms
3	To acquaint with file handling concepts in data structures

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Apply appropriate linear and non-linear data structures to solve problems	III	Applying
CO2	Implement various operations like insert, delete on data structures	III	Applying
CO3	Compare different sorting and searching algorithms to analyse the performance	IV	Analysing
CO4	Recommend the appropriate recursive algorithm to solve recursive problems	V	Evaluating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Program based on structures and pointers in C
2. Program based on arrays and pointers in C
3. File handling and command line arguments
4. Implementation of recursion
5. Developing ADT for singly linked list and its applications
6. Developing ADT for Doubly linked list and its applications
7. Developing ADT for circular linked list and its applications
8. Developing ADT for stack and queue and their applications
9. Implementation of double ended queue
10. Implementation of recursive and non-recursive tree traversals
11. Binary search tree and application
12. Implementation of graph, DFS, BFS
13. Implementation of searching : linear search, binary search, Fibonacci search
14. Sorting Methods: Insertion sort, shell sort, heap sort, quick sort, merge sort, radix sort etc.
15. Implementation of hash tables

Textbooks

1	Richard F. Gilberg, Behrouz A. Forouzan, “Data Structures, A Pseudocode Approach With C”, Cengage Learning, 2nd Edition, 2007
2	S. Lipschutz, “Data Structures with C”, Schaum's Outlines Series, Tata McGraw-Hill, 2nd edition, 2017
3	Narsimha Karumanchi “Data Structure and algorithms”, Careermonk 5th edition, 2011

References	
1	Yashavant Kanetkar, “Understanding pointers in C”, 6th edition, BPB Publication, 2019

Useful Links	
1	https://nptel.ac.in/courses/106/102/106102064/
2	https://archive.nptel.ac.in/courses/106/106/106106127/

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	2			3									2
CO2			3	2	2								3	
CO3		2	3											2
CO4	2				3								3	

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7IT252
Course Name	Computer Network Lab
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
		30	30	40	100
		Credits: 1			

Course Objectives

1	To introduce and configure various devices at TCP/IP layer
2	To demonstrate various routing protocol using network tools
3	To illustrate client server model for communication

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Demonstrate various Routing Protocols in computer networks using simulators	III	Applying
CO2	Implement various network topologies using switch, router and cables	IV	Analysing
CO3	Analyze TCP/IP datagram using CISCO packet tracer, wire shark and Pcap Library	IV	Analysing
CO4	Design client server communication model for campus network using CISCO packet tracer	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. List different network devices on TCP/IP layers and design case study for campus network
2. Design different computer network topologies in CISCO packet tracer
3. Implement various routing protocol using CISCO packet tracer
4. Design and implement subnetting concepts using CISCO packet tracer for given network
5. Design and implement subnetting concepts using CISCO packet tracer for given network
6. Design and implement Wi-Fi connectivity through DHCP using CISCO packet tracer
7. Capture and analyze LAN traffic using wire shark tool.
8. Demonstrate the TCP/IP header fields in wire shark
9. Capture and analyze LAN traffic using wire shark tool to guess the password
10. Implement client server application using socket programming for TCP/UDP in java

Textbooks

1	Larry Peterson and Bruce Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann, 6th Edition, October 2020
2	Behrouz A. Forouzan, "Data Communication and Networking" TMGH 4th edition., 2013

References

1	James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 7th Edition, Pearson Publication, 2016

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105183/

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2		2										2	
CO2		2		1	3				2				1	3
CO3	1		2		2								2	
CO4	1		3	2	2				3					3

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech.
Course Code	7IT253
Course Name	Python Programming Lab
Desired Requisites:	Computer Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Lectures	1 Hrs/Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Practical	2 Hrs/Week	30	30	40	100
		Credits: 2			

Course Objectives

1	To understand why Python is a useful scripting language for developers.
2	To learn how to design and program Python applications.
3	To make use of the different libraries of Python.
4	To implement python code and add visualization using various libraries.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Define the significance of the various data structures available in Python programming language and apply them in solving computational problems.	III	Applying
CO2	Analyze the programming models and make use of the different libraries of Python	IV	Analyzing
CO3	Implement, test and debug the code written in Python	VI	Creating
CO4	Design various kinds of plots using python libraries	VI	Creating

Module	**Module Contents**	**Hours**
I	**Introduction to Python:** Variables and Data Types: Introduction to different data types (integers, floats, strings, lists, tuples, dictionaries) ,operators and variable assignment Control Flow: Using conditional statements (if, else, elif) and loops (for, while) to control the execution flow of a program.	**4**
II	**Functions, Modules and packaging:** **Functions:** Defining and calling functions, understanding scope (local and global variables), and using lambda functions (anonymous functions) **Modules and Packages**: Importing and using standard libraries and creating custom modules. Files, System Functions and Parameters, Strings, Tuples, **Data Structures** -Lists and Dictionaries, Lists and Mutability, Functions as Objects. Programming using functions, modules and external packages.	**4**
III	**File handling:** Python 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,	**4**

	using file operations. Database Programming: Connecting to a database, Creating Tables, INSERT, UPDATE, DELETE and READ operations, Transaction Control, Disconnecting from a database, and Exception Handling in Databases.	
IV	**Classes and Object-Oriented Programming:** Abstract Data Types and Classes, Information Hiding, Class in Python Objects in Python, Polymorphism in Python, Encapsulation in Python Inheritance in Python, Data Abstraction in Python. **Exception Handling**:- Understanding exceptions, Handling exceptions using try, except, finally	**6**
V	**Python-Numpy and Pandas:** NumPy: Introduction, Numpy array, Numpy array indexing, Numpy operations. Pandas: Series, Data frames, managing missing data, groupby, merging & concatenation, operations, data input and data output. Introduction to NumPy and Pandas for data manipulation and analysis.	**4**
VI	**Python for Data Visualization:** Working with Graphs: Understanding and implementing graph algorithms, visualizing graphs using libraries -Matplotlib, Seaborn, Plotly and Cufflinks, Geographical Plotting. Matplotlib: Creating various types of plots (line, bar, scatter, histogram) and customizing them. Seaborn: Generating advanced visualizations and integrating with Matplotlib for enhanced graphics	**6**

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Problem solving using core Python functionality like strings, variables, functions.
2. Problem solving using core Python functionality like tuples, dictionary, list, objects
3. Problem solving using Class & object concepts.
4. Problem statement on inheritance in classes
5. Problem based on encapsulation in classes
6. Problem statement on array
7. Problem statement on NumPy libraries with different operations
8. Problem statement on Pandas libraries with different operations
9. Problem statement on NumPy and Pandas use for data manipulation and analysis.
10. Problem statement on data visualization using Matplot Libraries.
11. Problem statement on data visualization using Seaborn Libraries.

Best Practices for lab:

- Writing clean and readable code
- Testing and debugging
- Documentation and comments
- Version control with Git

Textbooks

1	R. Nageswara Rao, ―Core Python Programming‖, Dreamtech Press, 2nd Edition, 2017
2	Chun, J Wesley, ―Core Python Programming‖, Pearson, 2nd Edition, 2007 Reprint 2010
3	Eric Matthes - "Python Crash Course", "Automate the Boring Stuff with Python" 2nd Edition,2019

References

1	Barry, Paul, Head First Python, O Rielly,2nd Edition, 2010
2	Lutz, Mark, Learning Python, O Rielly, 4th Edition, 2009

Useful Links

1	https://onlinecourses.nptel.ac.in/noc19_mg47/preview

	https://onlinecourses.nptel.ac.in/noc24_cs45/preview https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2	https://docs.python.org/3/tutorial/
3	https://www.learnpython.org/
4	https://leetcode.com/
5	https://www.codewars.com/
6	https://www.hackerrank.com/

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2			3									2
CO2	1		3	2	2								3	
CO3		3	3											1
CO4	2				3								2	
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem III/IV
Course Code	7IT254
Course Name	OOP-I (CPP Programming) Lab
Desired Requisites:	C Programming or Any Procedural programming Language

Teaching Scheme		**Examination Scheme (Marks)**			
Lectures	1 Hrs/Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Practical	2 Hrs/Week	30	30	40	100
		Credits: 1			

Course Objectives	
1	To learn the fundamental programming concepts and methodologies which are essential to
2	building good C/C++ programs

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Describe Object Oriented Programming (OOP) concepts for real time applications	I	Understanding
CO2	Implement simple C++ programs using classes and objects	III	Applying
CO3	Compare procedural and object-oriented programming approaches	IV	Analysing
CO4	Assess the advantages and disadvantages of using classes and objects in C++	V	Evaluating

Module	Module Contents	Hours
I	**Introduction to OOP and Basics of C++:** Introduction to Object-Oriented Programming concepts, Understanding classes and objects, Basic syntax and structure of C++ programming language, Data types, variables, and operators in C++.	2
II	**Object and Classes:** Creating classes and objects in C++ , Member functions and data members, Access specifiers: public, private, and protected, Constructors and destructors	2
III	**Polymorphism:** Polymorphism and its types: compile-time and runtime polymorphism. Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable.	2
IV	**Inheritance-I:** Understanding inheritance and its types: single, multiple, multilevel, and hierarchical inheritance, Implementing inheritance in C++ using base and derived classes, ,Virtual functions and function overriding in C++	2
V	**Advanced OOP Concepts:** Abstract classes and pure virtual functions, Interface classes and their usage, Friend functions and friend classes	2
VI	**Exception Handling and Templates:** Understanding exceptions and exception handling in C++, Try-catch blocks and exception specifications, Introduction to C++ templates for generic programming, Writing and using class templates and function templates	2

List of Experiments / Lab Activities/Topics

List of Lab Activities:

List of Lab Activities:

1. Program on input/output stream
2. Program on class and objects.
3. Program on Inline/Friend functions.
4. Program on Constructor/Destructors.
5. Program static variables/class/functions.
6. Program on polymorphism.
7. Program on different types of inheritance.
8. Program on operator overloading.
9. Program on File Operations.
10. Program on Templates.

Textbooks

1	E.Balguruswamy, “Object Oriented Programming C++”, Tata McGraw Hill, 3rd Edition, 2006.
2	Bjarne Stroustrup, “The C++ Programming language”, Third edition, Pearson Education.

References

1	Robert Laffore, ”Object Oriented Programming in c++”, SAMS publication, 4thEdition,2008.

Useful Links

1	https://nptel.ac.in/courses/106/105/106105151

2	https://nptel.ac.in/courses/106/101/106101208/
3	

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	2			3									2
CO2	2		3	2	2								3	
CO3		2	3		1								1	2
CO4	1				3								2	
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

SEM II

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	B.Tech.
Class, Semester	Second Year (CSE and IT), Sem IV
Course Code	7IT221
Course Name	Fuzzy Set and Statistics
Desired Requisites:	Mathematics course at Higher Secondary Level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 03			

Course Objectives

1	Familiarize the students with techniques in probability and statistics.
2	Design a statistical hypothesis about the real world problem and conduct appropriate test for drawing valid inference about the population characteristics.
3	To give insights about the properties, operations and relations on Fuzzy sets.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to

CO	**Course Outcome Statements**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	Understand the concept of Fuzzy sets with case studies.	II	Understanding
CO2	Understand probability distributions for discrete and continuous random variable.	II	Understanding
CO3	Apply various discrete & continuous distributions to solve real life problems.	III	Applying
CO4	Apply numerical descriptions of data, measures of central tendency, measures of dispersion.	III	Applying
CO5	Test hypothesis particularly about mean and proportion and goodness of fit to make decisions in real life problems using concepts of Sampling distribution.	III	Applying

Module	**Module Contents**	**Hours**
I	**Fuzzy Sets:** Introduction to characteristics functions, First decomposition theorem, Fuzzy relations, examples, Fuzzy equations, Operations on Fuzzy sets.	**7**
II	**Random Variable:** Definition, Discrete random variable, Continuous random variable, Probability mass function, Probability density function, cumulative distribution function for discrete random variable and continuous random variable, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable.	**7**

III	**Probability Distribution :** Poisson distribution, Gaussian (Normal) distribution, Exponential distribution, Examples.	**6**
IV	**Basic Statistics:** Introduction, Measures of Central tendency, Measures of dispersion, moments, skewness and kurtosis.	**6**
V	**Sampling Distribution:** Population, Sample, Random samples, Methods of sampling, large sample, small sample, parameter, statistic, standard error of Statistic, sampling distribution of mean, sampling distribution of proportion, Examples. Hypothesis, null and alternative hypothesis, critical region, level of significance, Types of error, one tailed test, two tailed test.	**7**
VI	**Applied Statistics:** Test of significance for large samples, Hypothesis testing for single population proportion, hypothesis testing for single population mean, Examples, Test of significance for small samples, degrees of freedom, student t distribution: Definition and its properties, Test the significance of mean of random sample, Examples, Chi-square distribution: Definitions and its properties, chi square test, chi square test of goodness of fit, Examples.	**6**

Textbooks	
1	*"An Introduction to probability and Statistics"*, V.K. Rohatgi , Wiley Publication, 2nd Edition, 2008.
2	*"Fuzzy Sets and Fuzzy Logic: Theory and Applications",* George J. Klir and Bo Yuan, Pearson Education Services Pvt. Ltd., 4th edition, 2017.

References	
1	*"Introduction to Probability and Statistics for Engineers and Scientists",* Sheldon M. Ross, Academic Press, (2009).
2	"*Probability and Statistics",* Dr. Hari Arora, S.K.Kataria & Sons , 4th Edition , 2020.
3	*"Fundamentals of Mathematical Statistics",* Gupta and Kapoor, S. Chand & Sons Publishers, 10th Edition, 2000.

Useful Links	
1	https://www.khanacademy.org/math/statistics-probability
2	https://nptel.ac.in/courses/111/105/111105041/
3	https://youtu.be/IZWTduVCrf8?si=h5irtq4mAHao--_s
4	https://youtu.be/ToaI2MEC5x0?si=Lv6McGvy_db36HpW

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	1										2	
CO2	2	2		3										3
CO3	2		2	2									1	
CO4	3	2	1	3									3	2
CO5	3	1	2	2										

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Walchand College of Engineering, Sangli
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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7IT222
Course Name	Software Engineering
Desired Requisites:	Object Oriented Language

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
		Credits: 2			

Course Objectives

1	To introduce the concepts of software development process
2	To illustrate process of software project management
3	To explain software quality through testing

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Choose appropriate process model for software development life cycle (SDLC)	III	Applying
CO2	Study various phases of SDLC like Analysis, Design, Implementation, and Testing	IV	Analyzing
CO3	Compare various types of testing for software quality assurance	IV	Analyzing
CO4	Estimate cost of software deployment using various components and frameworks	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to Software Processes** The S/W problem, the software Engineering Approach & Benefits. Software Process, Characteristics of a software process. Software requirements, problem Analysis, Requirements Specification.	4
II	**Software Project Management** Cost estimation, project scheduling, staffing and personnel planning, Software Configuration Management plans, Quality Assurance plans, Project Monitoring Plans, Risk Management	4
III	**Software Design** Objective, Design principles, module level concepts, Design notation and specifications, Classes, Relationships, Common mechanisms. Diagrams, Class Diagrams, Interfaces, Use case diagram, Sequence Diagram and State Diagrams	5
IV	**Agile Processes** Agile Methodologies, Dynamic system development, Feature-driven Design, Crystal Agile Modelling.	4
V	**Software Testing** Testing Fundamentals (manual and automated testing), Testing Levels, Functional testing, Structural testing, Testing object oriented Programs, Regression Testing, Types of testing tools	5

VI	**Software Deployment** Components, Deployment, Collaboration, Patterns and Frame works, Component Diagrams and Deployment Diagrams	4
Textbooks		
1	Sommerville, "Software Engineering", Pearson Education India,New Delhi, 10th Edition, 2017	
2	Roger S Pressman, "Software Engineering – A Practitioner's Approach", McGraw Hill, USA,8th Edition, 2019	
References		
1	Pfleeger, "Software Engineering", Pearson Education India, New Delhi, 4th Edition,2009	
2	Mike O'Docherty, "Object-Oriented Analysis & Design: Understanding System Development with UML 2.0", John Wiley & Sons Publication, 1st Edition, 2005	
Useful Links		
1	https://onlinecourses.nptel.ac.in/noc20_cs68/preview	
2	https://archive.nptel.ac.in/courses/106/105/106105182/	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1		2									2	
CO2	2	2	1											3
CO3	2		3	1									1	
CO4	3	2		3									3	2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7IT223
Course Name	Operating System
Desired Requisites:	Computer Architecture

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
	-	**Credits: 3**			

Course Objectives

1	To Introduce concepts, functions and services of operating systems.
2	To inculcate the concepts of inter-process communication techniques.
3	To compare various memory management techniques of operating systems.
4	To explore file system structures and storage management

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Discuss various services provided by operating system to manage system resources	II	Understanding
CO2	Classify various process scheduling algorithm for multiprogramming	III	Applying
CO3	Study memory management techniques for logical to physical address	IV	Analysing
CO4	Analyse the file system management of operating systems	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction :** Notion of operating systems, Computer system organization, Computer System architecture, Computer System Structure, Operating System Operations, Process Management, Memory Management, Storage Management, protection and security. **System Structure:** Operating system services, user operating system interface, system calls, types of system calls, system programs, operating system design and implementation, operating system structure.	5
II	**Process** Process Concept, Process Scheduling, Operation on process, Cooperating process, Threads, Inter-process Communication (Algorithms evaluation). **Process Scheduling:** Basic concept, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, RR, Priority, Multilevel Queue Scheduling) , Multiple processor scheduling, Real time scheduling.	8
III	**Inter-process Synchronization** Background, Classical problems of synchronization, Critical Region, The critical section problem, Peterson's Solution, Synchronization Hardware, Monitors, Semaphores.	6

IV	**Deadlocks** System modes, Deadlock characterization, Methods for handling deadlocks Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.	5
V	**Memory Management** Background, Logical Versus Physical Address space, Swapping Contiguous Allocation, Paging, Segmentation, Segmentation with paging. **Virtual Memory:** Background, Demand paging, Page replacement, Page Replacement Algorithms (FIFO, LRU, Optimal), Allocation of frames, thrashing (Only concept), Demand segmentation. Memory Management in Various Operating Systems	8
VI	**File System Management** File concept, access methods, directory and disk structure, file-system mounting, file sharing, protection. File system structure, file-system implementation, directory implementation, Allocation Methods (Contiguous, Linked, Indexed), free-space management	6

Text Books	
1	James. L. Peterson and A. Silberchatz ,"Operating System Concepts", Addison Westley Publication, 9th Edition,2018
2	Milan Milenkovic ,"Operating System – Concept and Design", TMGH,1st Edition,2001

References	
1	William Stallings," Operating Systems : Internals and Design Principles",Peterson Publication,7th Edition,2013
2	Crowley Charles ," Operating Systems : A Design-Oriented Approach",Mc Graw Hill Publication,1st Edition,2017

Useful Links	
1	https://www.gatevidyalay.com/operating-system/
2	https://www.javatpoint.com/os-tutorial
3	https://www.geeksforgeeks.org/operating-systems/
4	https://onlinecourses.swayam2.ac.in/cec20_cs06/preview

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		1										2	2	2
CO2	2	1	2	3									3	
CO3		2	1		1								2	1
CO4		2			1									3

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli
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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7IT224
Course Name	Theory of Computation
Desired Requisites:	Discrete Mathematics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
		Credits: 3			

Course Objectives

1	To discuss fundamentals of theoretical computer science and its applications
2	To describe formal languages, grammar and their relationships
3	To explain automata designs as language descriptors and recognizers

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Draw directed graphs by labelling the path between nodes	I	Remembering
CO2	Outline problem formulation by following relevant solving approaches	II	Understanding
CO3	Demonstrate grammar productions and parsing by practicing derivation trees	III	Applying
CO4	Distinguish language based problems by identifying suitable solutions and complexity classes	IV	Analysing
CO5	Design abstract machines for language acceptance by recognizing its probable applications	VI	Creating

Module	**Module Contents**	**Hours**
I	**Proofs and Regular Languages** Types of Proofs, Mathematical Induction and Recursive definitions, Regular expressions & Regular languages, Operations on Regular languages	6
II	**Finite State Machines** Deterministic Finite Automata (DFA) representation, DFA design examples, Nondeterministic finite automata (NFA), NFA with Null (^) transitions, Equivalence of DFAs, NFAs and NFA-^s. Kleene's Theorem & Proofs, Minimization of DFA	8
III	**Grammar & Languages** Definition and Types of grammars and languages, Derivation trees and ambiguity, Context Free Languages (CFL) & Non CFL's., Union, Concatenation and Kleene's operations, Intersection and complements of CFLs, Pumping Lemma.	6
IV	**Push Down Automata (PDA)** Definition, Deterministic PDA, Types of acceptance and conversions to each other, PDA design examples, CFGs & PDAs., Top-Down, & Bottom-up parsing	7

V	**Chomsky Normal Form (CNF)** Context Free Grammar (CFG) & CNF notations, eliminating ^ production and unit productions from a CFG, Eliminating useless variables from CFG, CNF Significance, Applications	5
VI	**Turing Machines (TM)** Models of Computation, definition of TM as Language Acceptor, Combining TMs, Turing computable functions, TM design examples, Variations in TM, nondeterministic TM, and Universal TM.	7

Textbooks	
1	John C. Martin, "Introduction to Languages & Theory of Computation", TMH, 4th Ed. 2010
2	John E. Hopcraft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computations", Pearson Edu. 3rd Ed. 2008
References	
1	J. P. Tremblay & R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TMH, 2008
2	Michael Sipser, "Introduction to Theory of Computations", Thomson Brooks/Cole, 3rd Ed. 2014
3	K.L.P. Mishra & N. Chandrasekaran, "Theory of Computer Science", PHI, 3rd Ed. 2006
Useful Links	
1	https://nptel.ac.in/courses/106/104/106104028/
2	https://cglab.ca/~michiel/TheoryOfComputation/TheoryOfComputation.pdf
3	https://www.geeksforgeeks.org/introduction-of-theory-of-computation/

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3				2							1		
CO2		3	2											1
CO3				3	2								1	
CO4		2							1			3		
CO5			3	1									2	

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
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ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
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Walchand College of Engineering, Sangli

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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem III/IV
Course Code	7IT271
Course Name	Java Programming Lab
Desired Requisites:	Object Oriented Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
		30	30	40	100
Lecture	1 Hrs/week	**Credits: 2**			

Course Objectives

1	To introduce the object-oriented concepts of Java
2	To inculcate the Java APIs like multithreading and socket programming
3	To instruct about various applications of the GUI packages of Java

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Demonstrate concepts of Object Oriented Technology using java programming	III	Applying
CO2	Apply multi-threading and socket programming concepts to solve real time problems	III	Applying
CO3	Analyse the concepts of event handling in java using AWT	IV	Analyzing
CO4	Design and implement GUI using java swing	V	Creating

Module	Module Contents	Hours
I	**Fundamental Programming in Java** Structure of Java Program, Java programming environment-JVM, JIT Compiler, Bytecode, A simple Java program, source file declaration rules, naming conventions, objects and classes – declaring classes and objects, declaring member variables, defining methods, constructors, using objects, this keyword, final and static keyword, garbage collection	3
II	**Inheritance and package** What is inheritance, types of inheritance, interfaces, super keyword, final classes and methods, packages – importing packages, naming a package, creating a package	2
III	**Exception Handling and I/O** Exception handling – what is exception? dealing with errors, hierarchy of exception, types of exceptions, IO stream classes	2
IV	**Event Handling, AWT and Swing** Event handling – basics of event handling, AWT hierarchy, types of events, AWT components, swing advanced components.	2
V	**Multithreading and Networking** Processes and threads, runnable interface, thread class, thread objects, thread states, thread priorities, socket programming	2
VI	**Database Handling and Collections Framework** Database – design of JDBC, the structured query language, JDBC types, Driver Manager - statement, connection, result-set, Collections - Collection framework	2

List of Experiments / Lab Activities/Topics

List of Experiments:

1. Program on input/output stream.
2. Program on class and objects.
3. Program on Constructor/Destructors.
4. Program static variables/class/functions.
5. Program on polymorphism.
6. Program on different types of inheritance and interface.
7. Program on exception handling objects.
8. Program on multithreading.
9. Program on TCP/UDP communication.
10. Program on Swing components.
11. Program on AWT components.
12. Program on Database Connectivity and operations for data handling.
13. Program on different collections like TreeSet, Set, HashMap, ArrayList, Date,etc.

Textbooks	
1	Cay S. Horstmann, "Core Java Volume I Fundamentals", Prentice Hall, 12th Edition, 2020

References	
1	Herbert Schildt, "Java: The Complete Reference", McGraw Hill Education, 11th Edition, 2019
2	E. Balguruswamy, "Programming with Java: A Primer", McGraw Hill Education, 7th Edition, 2023

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_cs47/preview
2	https://nptel.ac.in/courses/106105191
3	https://www.codecademy.com/learn/learn-java

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		2		1	1								2	
CO2					3				2					2
CO3	1		2	2	2								3	1
CO4	2			1	3				2				1	2

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem III/IV
Course Code	7IT272
Course Name	Android Programming Lab
Desired Requisites:	Object oriented Programming concepts

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	1 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Practical	2 Hrs/ Week	30	30	40	100
		Credits: 2			

Course Objectives

1	To introduce the android architecture and tools for developing Android applications
2	To impart current client side and server side web technologies on Android platform
3	To provide user interface application development

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Describe the life cycles of android application development	III	Applying
CO2	Choose appropriate database for android application	III	Applying
CO3	Use the major components of Android API to develop application	IV	Analysing
CO4	Deploy applications to the Android marketplace for distribution	VI	Creating

Module	**Module Contents**	**Hours**
I	**Android Overview** Introduction to mobile computing, installing of required software and preparing the working environment, creating your first Android Application	2
II	**Intents and Layouts** XML, Android View Hierarchies, Linear Layouts, Relative Layout, Table Layout, Frame Layout Sliding, Using Padding and Margins with Layouts. What is Intent? Android Intent Messaging via Intent Objects, Types of Intents, Using Intents with Activities, Sending Intents (Telephony, SMS), Broadcast Receivers	3
III	**Input Controls, Input Events, Dialogs** Buttons, Text Fields, Checkboxes, Radio Buttons, Toggle Buttons, Spinners, Event Listeners, Event Handlers, Touch Mode, Handling Focus, Dialogs: Alerts, Popups, Toasts	2
IV	**Menus, Notification and Action Bar** Menus, Options menu, Context menu, Popup menu, Handling menu click events, Creating a Notification, Notification actions, Notification priority, Managing Notifications, Removing notifications	2
V	**Android Database** Installing SQLite plugin, DB Helper, The Database Schema and Its Creation, Four Major Operations, Cursors, Example, overview of other database used for Android	2

VI	**Publishing Android Application.** To deploy and publish the Mobile Apps, Introduction to Flutter and Kotlin, Permissions, Application resources.	2

List of Experiments / Lab Activities/Topics

List of Lab Activities:

List of Lab Activities:

1. Installation of Android SDK, emulator, creating simple project and study of android project structure.
2. Installing apk on mobile device/tablet, configuring mobile device/tablet in Android Studio with developer option and running app directly on mobile device/tablet.
3. Write a program to use of different layouts.(Create Login form using Linear Layout and Relative Layout).
4. Write a program to study Intents for switching between activities. - Create Registration Activity and Registration Layout
5. Write a program to use of Intents for SMS and Telephony
6. Write a program to study and demonstrate BroadcastReceiver
7. Write a program to demonstrate Buttons, Text Fields, Checkboxes, Radio Buttons, and Toggle Buttons with their events handler (Create an app which will cover the different components, and try adding the components and different events henceforth so as to create a fully developed Android application)
8. Write a program to demonstrate Spinners, Touch Mode, Alerts, Popups, and Toasts with their events handler
9. Write a program to demonstrate Touch Mode, Menus with their events handler
10. Write a program to demonstrate notification with their action
11. Write a program to study and use of SQLite database
12. Study of publishing app to the Android Market.

Textbooks

1	Beginning Android application development by Wei-Mag Lee
2	Learning Android by Marko Gargenta Publisher: O'Reilly Media
3	Android Apps for Absolute Beginners by Wallace Jackson 2nd Edition

References

1	Robert Laffore, ”Object Oriented Programming in c++”, SAMS publication, 4thEdition,2008.

Useful Links

1	Beginning Android4 Application Development, By Wei-Meng Lee WILEY India Edition WROX Publication s
2	Professional Android 4 Application Development, By Reto Meier WROX

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		2		1	2									1
CO2					3				2				2	3
CO3		1		2	2								2	1
CO4		3		1	3								3	

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7VSIT245
Course Name	Mini Project 1
Desired Requisites:	Programming fundamentals

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
	-	30	30	40	100
		Credits: 1			

Course Objectives

1	To provide guidance to select & build the ideas.
2	To help students to address real-world challenges by IT based Solution.
3	To guide students to acquaint with team spirit.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Exploit the concepts of Programming languages, tools and technologies	III	Applying
CO2	Analyze performance of mobile application	IV	Analyzing
CO3	Survey existing challenges & try to address it	V	Evaluating
CO4	Design project modules to report solutions to various problems.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

Mini-project is to be carried out in a group of maximum 3 to 5 students.
Each group will carry out mini-project on developing any mobile application software based on following areas.
1. Android/C/C++/Python or any equivalent language.
2. Industry Problem Statement (Sponsored Project)
3. Problem statements based on current or previously learned Technology.
4. Data analysis using spreadsheets

Project/Mini-Project group should submit workable project at the end of second semester.
Project report (pre-defined template) should be prepared using Latex/Word and submitted along with soft copy on CD/DVD (with code, PPT, PDF, Text report document & reference material) or on online Github.
Students should maintain a project log book containing weekly progress of the project.

Textbooks

1	--

References

1	--

Useful Links

1	--

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
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CO1		1			2								3	
CO2	2		2		3						2		2	1
CO3	2	1		3	3					3	1			3
CO4		2		2	3					1				

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Assessment

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AY 2024-25

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Semester IV
Course Code	7MDIT221
Course Name	Data Structures and Algorithms
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
		Credits: 3			

Course Objectives

1	Exploring basics of data structures and algorithms.
2	Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs
3	Familiarize sorting and pattern matching algorithms

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Apply various data structures for problem solving	III	Applying
CO2	Apply important algorithmic design paradigms and methods of analysis	III	Applying
CO3	Compare various Searching and sorting techniques	IV	Analyzing
CO4	Evaluate efficiency of the programs based on performance of the algorithm	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction** Basic Concepts: Algorithm, Pseudo-code, ADT, Data Structure, Algorithmic Efficiency, And Recursion, Dynamic Memory allocation, Introduction of Pointers to Arrays ,functions and Structures	4
II	**Linear Lists, Stacks and Queues** Sequential and linked implementations, equivalence problem, linked lists, doubly linked lists, circular lists	6
III	**Non-Linear Structures** Basic terminology, binary trees and its representation, binary tree traversals , operations	8
IV	**Searching and Sorting Techniques:** Importance of searching, Sequential, Binary, Insertion Sort, Bubble Sort, Quick sort and Merge sort	8
V	**Introduction to Computer Algorithm** Design and Analysis of Algorithm Greedy Algorithms: Knapsack problem, Huffman codes, Dynamic Programming	7
VI	**Backtracking Programming** Concept, Advantages & Disadvantages, Applications, Implementation using problems like N-Queen Problem	6

Textbooks

1	Richard F. Gilberg, Behrouz A. Forouzan, “Data Structures, A Pseudocode Approach With C”, Cengage Learning, 2nd Edition, 2007
2	Cormen T, Introduction to Algorithms, MIT Press,4th Edition, 2022
References	
1	Brad Miller and David Ranum, Luther College, “Problem Solving with Algorithms and Data Structures Using Python,” Franklin, Beedle &Associates, 2017
2	Wirth, N., “Algorithms and Data Structures”, Prentice-Hall of India, 2013
Useful Links	
1	https://nptel.ac.in/courses/106/102/106102064/
2	https://nptel.ac.in/courses/106/106/106106127/
3	https://nptel.ac.in/courses/106/103/106103069/

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
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CO1	3	2												2
CO2	2	3			1								1	
CO3		1	2		2								3	
CO4	3	2	1											1

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)