Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	
Course Name	Probability and Statistics
Desired Requisites:	Mathematics course at Higher Secondary Junior College

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	2Hrs/Week	20	20	60	100
Practical	-				
Interaction	-	**Credits: 02**			

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.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	**Apply** computational tools to solve Mathematical and Statistical problems	Apply
CO2	**Solve** problems in probability, statistics.	Apply

Module	**Module Contents**	**Hours**
I	**Random Variable** Discrete random variable, Continuous random variable, Probability mass function, cumulative distribution function, Bivariate discrete random variable, Joint probability distribution Joint distribution function of two dimensional discrete random variable.	4
II	**Probability Distribution** Gaussian Distribution, Exponential Distribution, Uniform Distribution	4
III	**Statistical Methods** Measure of central tendency , measure of dispersion , range, Quartile deviation , mean deviation , Variance, Standard deviation, coefficient of variance, Moments, Symmetry, Skewness , Kurtosis and types of kurtosis	5
IV	**Population and Sample** Introduction, Types of Characteristics: Attributes and Variables, Collection and Organization of data, Population and sample, Methods of Sampling.	3
V	**Exact Sampling Distribution** Chi-square distribution: Definitions and its properties, Student t-distribution: Definitions and its properties.	4

VI	**Testing of Hypothesis** Random samples , Parameter, statistic, standard error of Statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, small sample test	7
Text Books		
1	Gupta and Kapoor, “Fundamentals of Mathematical Statistics”.	
2	Vijay Rohatgi, “An Introduction to Probability and Statistics”.	
References		
1	Sheldon M. Ross, “Introduction to Probability and Statistics for Engineers and Scientists”, Academic Press, (2009)	
Useful Links		
1	https://www.youtube.com/watch?v=aKohB8lPueg	

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

Assessment
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom’s Taxonomy Level (Marks)					
Bloom’s Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	20	20	60	100
4	Analyze				
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	
Course Name	Discrete Mathematics
Desired Requisites:	Mathematics-(set theory, Boolean operations, logical operations)

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	Deliver basic concepts of Logic theory to solve real life problems.
2	Introduce graphs, trees and algebraic structure and develop an attitude to solve problems based on these topics.
3	To give deep insight into discrete probability and combinatorics

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Explain logical notation to define and reason about fundamental mathematical concepts of logic theory, set theory, relations, probability, counting techniques.	Understanding
CO2	Demonstrate knowledge and skills obtained to investigate and solve problems of POSET, Hasse diagram, groups, semi group and monoid	Applying
CO3	Analyse concepts and algorithms of graph theory and elementary combinatorial processes such as permutations and combinations.	Analysing

Module	**Module Contents**	**Hours**
I	**Mathematical Logic & Set Theory** Introduction, Statement and Notation, Connectives, statements formulas and truth tables, well-formed formulas, Tautologies Equivalence of formulas, Tautologies, other connectives, Normal & Principal Normal forms. Basic concepts of set theory, Venn Diagram, set operation, algebra of sets.	6
II	**Relations and Functions** Relations, Pictorial representation of Relations, Properties of binary relation, Equivalence Relations, partition and covering of set, POSET and Hasse Diagram, Functions - types, Inverse and composition of functions, lattice	7
III	**Algebraic structures** Introduction, Operations, semigroups, Groups, subgroups, Rings, monoid.	6

IV	**Graph theory and its applications** Basic terminology, multigraphs and weighted graphs, Paths and Shortest path in weighted graphs, Hamiltonian and Eulerian Paths and Circuits, Factor of a graph, Planner Graph.	7
V	**Directed graphs** Trees, Rooted Trees, Path lengths in rooted trees, Prefix codes, Binary search trees, Spanning trees and cut sets, Minimal spanning trees, Kruskal's algorithm and Prim's algorithms, Warshall's algorithm for transitive closure..	6
VI	**Permutation, Combination and Discrete Probabilities** Basic counting techniques – inclusion and exclusion, Rules of sum and product, permutations, combinations, generation of permutations and combinations, Introduction to Discrete Probability, entropy and mutual information, recursion.	7

Text Books	
1	J.P. Tremblay &R. Manohar , "Discrete Mathematical structure with applications to computer", McGraw Hill,1st Edition, 2001
2	Liu, "Elements of Discrete Mathematics", Tata McGraw Hill,3rd edition 2008
3	Kenneth Rosen, "Discrete Mathematics & its application" McGraw Hill, 7th edition 2012.

References	
1	K.D. Joshi, "Foundation of Discrete Mathematics", New Age International Ltd,1st edition,2014
2	Seymour Lipschutz , Marc Lipson "Discrete Mathematics: Schaum's Outlines Series", Schaum's outline series.,3rd edition, 2009

Useful Links	
1	DM course on Udemy: Link
2	Course on NPTEL:Link

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	2												1		

1:Low, 2:Medium, 3:High

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**

1	Remember				
2	Understand	10	5	15	30
3	Apply	10	10	20	40
4	Analyze		5	25	30
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	
Course Name	Data Structures
Desired Requisites:	Programming in C including pointers and File Handling

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To make the students understand elementary linear and non-linear data structures and concepts of ADTs.
2	To develop and improve logical thinking and to make the students capable of applying appropriate data structure for modelling a given problem.
3	To provide a foundation to analyse and compare various searching and sorting techniques and to select appropriate technique to solve the problem.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Explain the fundamental concepts of structuring, managing and organizing the data using linear and non-linear data structures with ADTs, write recursive algorithms and explain various searching and sorting techniques	Understand
CO2	Choose suitable data structure to be used and apply it to solve the various problems	Apply
CO3	Compare and Analyze various algorithms, searching and sorting methods based on inherent properties of data structures and the complexity of algorithms.	Analyze

Module	Module Contents	Hours
I	**Basic Concepts** Algorithm, Pseudocode, ADT, Data Structure, Algorithmic Efficiency Recursion: Direct and Indirect recursion, analysis of recursive functions e.g. Towers of Hanoi, Ackerman's function, etc	6
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.	6
III	**Stacks and Queues** Fundamentals stack and queue as ADT, Representation and Implementation of stack and queue using sequential and 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.	6
IV	**Trees** Basic terminology, binary trees and its representation, binary tree traversals (recursive and non-recursive), operations such as copy, equal on binary tree, expression trees, AVL Tree, Binary Search Trees, Heaps and its operations, Introduction to Multiway Trees.	7
V	**Graphs** Terminology and Representation of graphs using adjacency matrix, adjacency list and adjacency Multilist, Traversals Depth First and Breadth First, Minimum Spanning Tree.	5
VI	**Searching & Sorting Technique** **Searching:** 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	9
Text Books		
1	Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures, A Pseudocode Approach With C",Cengage Learning, Second Edition, 2014	
2	S. Lipschutz, "Data Structures,Schaum's" Outlines Series, Tata McGraw-Hill, 2013	
3	Ellis Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 2008	
References		
1	Yashavant Kanetkar, "Understanding pointers in C", BPB Publication, 4th Edition, 2009	
2	N. B. Venkateshwarlu, E. V. Prasad, "C and Data Structures", S. Chand and Company, 2010	
3	Jean-Paul Tremblay, Paul. G. Soresan, "An introduction to data structures with Applications", Tata Mc-Graw Hill International Editions, 2nd edition, 1984	

Useful Links	
1	http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
2	https://www.coursera.org/learn/data-structures
3	http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/dslab/index.php
4	https://nptel.ac.in/courses/106/106/106106130/

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

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	15	15	30	60
3	Apply	5	5	20	30
4	Analyze			10	10
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	
Course Name	Data Communication
Desired Requisites:	Nil

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To elaborate various features and operations of data communication.
2	To inculcate protocol functions and issues related to the Data Link layer.
3	To introduce the design and configuration of various networking techniques.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Describe fundamental concepts of data communication system	Understand
CO2	Interpret various concepts related to data link layer protocols	Apply
CO3	Differentiate and analyze various data communication techniques	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction** A Communications Model, Data Communications, Networks, The Internet-An Example, Configuration. Data communication Concepts and Terminology: Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity. Media: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission Types of electronics communication, Electromagnetic spectrum, Bandwidth, Signal Types, Noise: internal, External, Noise calculation.	4
II	**Encoding techniques** Digital Data- Digital Signals, Digital Data- Analog Signals, Analog Data- Digital Signals, Analog Data- Analog Signals. Digital data communication techniques: - Asynchronous and Synchronous Transmission, Types of Errors, Error Detection & Correction, Hamming Code, CRC, Checksum, Line Configurations, Numerical problems on encoding.	8
III	**Multiplexing** Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing, Pulse code modulation, Delta modulation, Adaptive delta modulation, Differential PCM, PAM. Spread Spectrum: The Concept of Spread Spectrum, Frequency-Hopping Spread Spectrum, Direct Sequence Spread Spectrum, Code Division Multiple Access.	8
IV	**Switching techniques**	8

	Switched Communications Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Soft switch Architecture, Packet-Switching Principles, X.25, and Frame Relay. Introduction to Asynchronous Transfer mode protocol Architecture, Logical Connections, ATM Cells, Routing in Arpanet.	
V	**Congestion control** Effects of Congestion, Congestion Control, Traffic Management, Frame Relay Congestion Control. Cellular wireless network: Principles of Cellular Networks, First-Generation Analog Second- Generation CDMA, Third-Generation Systems.	5
VI	**Flow Control and Internet Reference Models** Framing –Fixed, Variable error control, Flow control, Simplest Protocols, Stop & Wait Protocols, GO Back N & Selective Repeat Sliding window protocols, Numerical problems on flow control techniques, other Protocols. Internet and Reference models-OSI, TCP/IP.	6

Text Books	
1	Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 4th/5th Edition, 2017.
2	William Stallings, "Data and Computer Communications", Prentice Hall(PHI) , 8th /9th Edition, 2010/2011

References	
1	James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education,5th /7th edition, 2012/2016

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105082/

CO-PO Mapping

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

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	7	7	20	34
3	Apply	7	7	20	34
4	Analyze	6	6	20	32
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	
Course Name	Computer Organization and Architecture
Desired Requisites:	Basic Electronics Engineering

Teaching Scheme		Examination Scheme (Marks)			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To introduce organization and architecture of computer.
2	To provide a foundation to write an 8 bit microprocessor program using assembly language.
3	To infuse understanding of usefulness X-86 microprocessor family and other processors and fundamental principles of ARM processors.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Describe basic concepts of the organization and architecture of computer and interfacing with external devices.	Understanding
CO2	Illustrate the knowledge gained about the data representation, internal organization, addressing modes, instruction set of 8085, 8086 and ARM processor for assembling language programming.	Applying
CO3	Analyze the working of processors like 8085,8086,ARM and interfacing of external devices like memory and I/O.	Analyzing

Module	Module Contents	Hours
I	**Introduction to Computer Organization** Introduction to Computer Organization and architecture, A brief history of computers, Von Neumann Architecture, designing for performance, Multicore, MICs and GPGPUs, Two Laws that Provide Insight: Amdahl's Law and Little's, Basic Measures of Computer Performance: Clock Speed, Instruction Execution Rate. Top level view of computer function and evolution: Computer Components, Computer Function, Interconnection Structures, Bus Interconnection, Point-to-Point Interconnect, PCI Express.	6
II	**Data Representation and Computer Arithmetic** The Arithmetic and Logic Unit, Integer Representation, Integer Arithmetic, Floating-Point Representation, Floating-Point Arithmetic, Programmable Logic Devices.	6
III	**8085 Microprocessor** CPU organization, Microprocessors, Machine language, Assembly Language, Computer classification, Microprocessor Architecture, microcomputer systems; Single chip microcomputer: Microcontrollers, The 8085 microprocessor, machine cycles, 8085 Programming model, Instruction classification, Instruction Data format and storage, 8085 Instructions: Data transfer operations, Arithmetic operations, Logic operations, Branch operations.	8
IV	**X-86 microprocessor Family** Microprocessor Architecture -8086, Register organization of 8086, Signal descriptions of 8086 chip, Physical Memory organization, Introduction to Maximum and Minimum mode operation, Addressing Modes, Co-processor configuration, interfacing of Co-processor with 8086.	7
V	**Interfacing of Memory & Input / Output Devices** Memory mapped I/o and I/O mapped I/O. Address decoding, interfacing of memory chips with 8085. Interfacing of interrupt controller with 8085, Programmable Interrupt Controller (8259A). Direct Memory Access (DMA), Stacks and subroutines.	7
VI	**Introduction to ARM Processor** Arm core dataflow model, Registers, Current program status register, Pipeline, Exception, interrupt and vector table, Core extensions, Arm processor families, Data processing instruction and Arithmetic instruction.	7

Text Books

1	William Stallings, "Computer Organization and Architecture: Designing for Performance", Pearson Education, 8th Edition/10th Edition, 2010/2016
2	Ramesh S. Gaonkar, "Microprocessor architecture, programming & applications", Penram International publications (India) Pvt. Ltd, 6th edition, 2013
3	N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, "Microprocessors and Interfacing", Oxford Higher Education, 1st Edition, 2012

References	
1	David A. Patterson and John L. Hennessy "Computer Organization and Design: The Hardware/Software Interface", Elsevier, 5th Edition, 2013
2	Ram, "Fundamentals of Microprocessors and Microcontrollers", Dhanpat Rai Publications, 1st edition, 2012
Useful Links	
1	ARM Based Development course, NPTEL(https://nptel.ac.in/courses/117106111/)

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	2	2										3	
CO3	3	2	2										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.														

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	10	10	30
3	Apply	10	10	20	40
4	Analyze			30	30
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	
Course Name	Software Engineering
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To unleash the orientation & importance of engineering approach to software development.
2	To infuse the knowledge of software processes & models practiced at IT industries.
3	To acquaint students with the SDLC phases in detail.
4	To emphasize on Design aspect with UML technology.
5	To inculcate the importance of software quality by virtue of software testing methods.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Grasp industry processes on software development to become IT industry-savvy.	Understand
CO2	Prepare with the spirit of team-working and importance of using artifacts at SDLC phases.	Apply
CO3	Distinguish and evaluate procedural & OO based development practices.	Analyze
CO4	Integrate expertise on CASE tools usage especially for design and testing of software to undertake industrial strength software projects.	Create

Module	**Module Contents**	**Hours**
I	**Software Processes** Need of software engineering approach, ETVX model, project management process, software development process & models, configuration management process, process management process.	6
II	**Software Quality & Project Planning** Quality objectives, software quality factors, PAF Model, quality standards, project management plan, cost estimation, project scheduling, personnel planning with WBS, risk management.	6
III	**Software Requirement Analysis & Function Oriented Design** Software requirement process, need and characteristics of SRS artifact, design principles, module level concepts, design notation and specifications, structured design methodology.	7
IV	**Object Oriented Design with UML & Continual Integration**	8

	UML model, UML diagrams: Use-case, Class, Activity, State-chart, Interaction, Sequence, Collaboration, Component, Deployment. Continual integration with Agile model process frameworks.	
V	**User Interface Design & Coding** UI rules, UI analysis and steps in UI design, best programming practices such as TDD & pair programming, verification.	4
VI	**Software Testing** Testing purpose and concepts, test process, levels of testing, regression testing, test case design for functional testing & structural testing. Study of Open-source Tools.	8

Text Books	
1	Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishers, 3rd Edition, 2005.
2	Ian Sommerville, "Software Engineering", Addison-Wesley, 7th Edition, 2004.
3	James Rumbaugh, "Object Oriented Modeling and Design with UML", Pearson, 2nd Edition, 2004.

References	
1	Roger S. Pressman, "Software Engineering: Practitioner's Approach", McGraw Hill, 7th Edition, 2010.
2	Jawadekar W.S., "Software Engineering: principles and practices", Tata McGraw Hills, 1st Edition.
3	Gillies A.C. and Smith p., "Managing Software Engineering: CASE studies and solutions", Chapman and Hall, London.

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105182/
2	https://www.javatpoint.com/software-engineering-tutorial

CO-PO Mapping

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**

1	Remember				
2	Understand	15	10	20	45
3	Apply	5	5	20	30
4	Analyze		5	15	20
5	Evaluate				
6	Create			5	05
Total		**20**	**20**	**60**	**100**

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	
Course Name	Programming Lab 1
Desired Requisites:	Introduction to any Programming Language

Teaching Scheme (Hrs)		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2				
Interaction	-	**Credits: 1**			

Course Objectives

1	To provide in-depth coverage of object-oriented programming principles and techniques using C++ and Python.
2	To inculcate the advanced programming concepts in C++ and Python.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Explain the features of object oriented programming using C++ and Python.	Understand
CO2	Demonstrate the solution to real world problems using C++ and Python.	Apply

List of Experiments / Lab Activities

List of Experiments:

1. Program based on creating Class and Object.
2. Program based on constructor and destructor.
3. Implementation of Inheritance and polymorphism.
4. Programs on files.
5. Programs based on use of template, generic template and function.
6. Programs based on namespaces.
7. Program based on expression, data type, functions.
8. Programs based on implementation of loops, strings, lists and dictionaries.
9. Programs based on Graphical user interface design using python.
10. Programs related to Multi-threading, Exception handling, file handling.

Text Books	
1	Herbert Schildt, "The Complete Reference: C++" Tata McGraw-Hill, 4th Edition, 2010
2	E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill, 4th Edition, 2008
3	Kenneth Lambert, "Fundamentals of Python: First Programs" Course Technology, Cengage Learning.2nd edition, 2017

References	
1	Stanley B. Lippman , "C++ Primer" Pearson , 4th Edition, Jan 2010

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs32/announcements?force=true
2	https://www.javatpoint.com/cpp-tutorial
3	https://www.w3schools.com/python/

CO-PO Mapping

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30

LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand	10	10	15	**35**
Apply	20	20	25	**65**
Analyze				
Evaluate				
Create				
Total Marks	**30**	**30**	**40**	**100**

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	
Course Name	Data Structures Lab
Desired Requisites:	Programming in C including pointers and File Handling

Teaching Scheme (Hrs)		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2				
Interaction	-	**Credits: 1**			

Course Objectives

1	To develop and improve skills in programming in a systematic way and preparing the students for advanced computer science courses.
2	To make the students understand the concept of ADT, recursion, various searching and sorting

	algorithms along with their performance comparisons and to use appropriate data structure for modelling given problem.	
3	To inculcate theoretical and practical knowledge of various linear and nonlinear data structures to solve real world problems.	
Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Demonstrate the concept of recursion, abstract properties of various linear and nonlinear data structures, searching and sorting methods through implementation.	Apply
CO2	Identify suitable data structure to be used to solve the various problems.	Analyze
CO3	Select appropriate searching, sorting method on the basis of its performance while developing application.	Evaluate

List of Experiments / Lab Activities

List of Experiments:

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

Text Books

1	Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures, A Pseudocode Approach With C", Cengage Learning, Second Edition, 2014
2	S. Lipschutz, "Data Structures", Schaum's Outlines Series, Tata McGraw-Hill, 2013
3	Ellis Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 2008

References

1	Yashavant Kanetkar, "Understanding pointers in C", BPB Publication, 2009
2	N. B. Venkateshwarlu, E. V. Prasad, "C and Data Structures", S. Chand and Company, 2010

Useful Links

1	http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
2	https://www.coursera.org/learn/data-structures

3	http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/dslab/index.php
4	https://nptel.ac.in/courses/106/106/106106130/

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	20	20	20	**60**
Analyze	10	10	10	**30**
Evaluate			10	**10**
Create				
Total Marks	**30**	**30**	**40**	**100**

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Computer Organization And Architecture Laboratory
Desired Requisites:	Programming by using assembly language

Teaching Scheme (Hrs)		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2				
Interaction	-	**Credits: 1**			

Course Objectives	
1	To infuse skills of drawing flowchart by using assembly language programming.
2	To demonstrate block transfer, arithmetical, logical operations and code conversion method by using assembly language programs.
3	To demonstrate the working of ARM processor.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Grasp the fundamentals of assembly level programming using microprocessor trainer kit and interfacing with other I/O devices.	Understanding
CO2	Demonstrate programming proficiency using the various addressing modes and instructions set (Block transfer, arithmetical, logical operations and code conversion method) of 8085 and X-86 microprocessor.	Applying

List of Experiments / Lab Activities

List of Experiments:

1. Introduction to digital fundamental circuit design.
2. Study of the design combinational and sequential circuit.
3. Introduction of Microprocessors and Study of 8085 Microprocessor and instruction set.
4. Write a program to perform 8-bit block transfer.
5. Write a program to perform 8-bit and 16-bit addition /subtraction/multiplication/division.
6. Write a program to find largest /smallest number in an array of data.
7. Write a program to find smallest no in an array of data.
8. Write a program to find 16 bit 2's complement no of 4340H
9. Write a program to transfer 16 bytes of data stored in location at C250 to C25F to new memory locations starting from C300 on words.
10. Write a program to transfer a block of data. The data is stored in memory from C550 H to C555F H. The data is to be stored from C570 H to C57F H in reverse order.
11. Write a program to arrange 10 bytes data in ascending /descending order. The data is stored in memory as an array starting from C100 H onwards.
12. Write Convert a binary number to a BCD number.
13. Write a program to square of number using lookup table.
14. Write X86/64 ALP to perform basic arithmetic operation.
15. Write X86/64 ALP to count number of positive and negative numbers from the array.
16. Write X86/64 ALP to perform multiplication of two 8-bit hexadecimal numbers. Use successive addition and add and shift method (Use of 64-bit registers is expected).
17. Write X86/64 ALP to convert 4-digit Hex number into its equivalent BCD number and 5-digit BCD number into its equivalent HEX number.
18. Case study: ARM Processor.

Text Books	
1	William Stallings, "Computer Organization and Architecture: Designing for Performance", Pearson Education, 8th Edition/10th Edition, 2010/2016
2	Ramesh S. Gaonkar, "Microprocessor architecture, programming & applications", Penram International publications (India) Pvt. Ltd, 6th edition, 2013
3	N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, "Microprocessors and Interfacing", Oxford Higher Education, 1st Edition, 2012

References	
1	David A. Patterson and John L. Hennessy "Computer Organization and Design: The Hardware/Software Interface", Elsevier, 5th Edition, 2013
2	Ram, "Fundamentals of Microprocessors and Microcontrollers", Dhanpat Rai Publications, 2012

Useful Links	
1	ARM Based Development course, NPTEL(https://nptel.ac.in/courses/117106111/)

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand	20	10	10	**40**
Apply	10	20	30	**60**
Analyze				
Evaluate				
Create				
Total Marks	**30**	**30**	**40**	**100**

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Applied Mathematics for Computer Science and Engineering
Desired Requisites:	Engineering Mathematics I and Engineering Mathematics II

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To infuse an understanding of the mathematical theory of Linear Algebra, Evaluation metrics for computer science engineers.
2	To provide a foundation to solve practical problems in cryptography, data science and machine learning.
3	To give insights about the properties, operations and relations on Fuzzy set.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	**Illustrate** the concept of Linear Algebra and Fuzzy sets with case studies.	Understanding
CO2	**Apply** various evaluation metrics for result analysis	Applying
CO3	**Solve** mathematical problems using tools from mathematical areas, including algebra, analysis, evaluation metrics and number theory.	Applying

Module	**Module Contents**	**Hours**
I	**Vector Spaces** Introduction, Vector spaces, Linear combinations, Spanning sets, Subspace, Linear dependence and independence, Basis and dimension, Null space, Column space, Row space, Rank-Nullity theorem.	6
II	**Advanced Concepts in Linear Algebra** Vector dot product, Inner product space, Length and orthogonality, Orthogonal sets, Orthonormal sets, Orthogonal projections, Gram-Schmidt Process, Least square problems, Applications and significance of Eigen values and Eigen vectors.	7
III	**Fuzzy Sets** Introduction to characteristics functions, First decomposition theorem, Fuzzy relations, examples, Fuzzy equations, Operations on Fuzzy sets.	7
IV	**Exploratory Data Analysis** Discrete and continuous random variables, PDF, CDF, percentile, Inter quartile range, central tendency (mean, mod, median, dispersion, skewness, kurtosis), variance, standard deviation, Mean Absolute Deviation (MAD), Standardization (Z-score), Normalization.	6

V	**Evaluation metrics** Intersection over union (IoU), Inception score, Frechet Inception distance, BLEU, METEROR, Rough, CIDER score, Confusion Matrix, F1 Score, Recall or Sensitivity, Gain and Lift Charts, Kolmogorov Smirnov Chart, AUC – ROC, Log Loss, Gini Coefficient, Concordant – Discordant Ratio, Root Mean Squared Error.	7
VI	**Number theory** Primality Testing: Primality Tests, Pseudo primes, Fermat's pseudo primes, Factorization techniques, Multiplicative inverse. Euclidean algorithm, Chinese remainder theorem, Fermat's little theorem, Wilson's theorem, Primitive roots, Quadratic residues.	7

Text Books	
1	Gilbert Strang, "Linear Algebra and its applications", Cengage Learning, 4th edition, 2014
2	George J. Klir and Bo Yuan, " Fuzzy Sets and Fuzzy Logic : Theory and Applications", Pearson Education Services Pvt. Ltd., 4th edition, 2017
3	Timothy C. Urdan, "Statistics in Plain English", Routledge-Taylor and Fransis Group, 3rd Edition, Volume 1, 2010.
4	Alice Zheng, "Evaluating Machine Learning Models" O'Reilly Media, 2015

References	
1	Seymour Lipschutz and Mark Lipson,"Schaum's outlines of Theory and Problems of Linear Algebra", Tata McGraw Hill, 3rd Edition, 2007.
2	William Stein, "Elementary Number Theory: Primes, Congruences, and Secrets", Springer, 1st Edition, 2008.

Useful Links	
1	https://www.khanacademy.org/math/statistics-probability

CO-PO Mapping

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

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	15	10	20	45
3	Apply	5	10	40	55
4	Analyze				

5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Formal Language and Automata Theory
Desired Requisites:	Discrete Mathematics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To explain basic terminologies related to formal languages and Automata theory.
2	To provide foundation to critically analyze grammars, regular expressions, languages, and their relationship.
3	To inculcate theoretical knowledge to design Automata/Machine as a language descriptor and recognizer.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Explain the fundamental concepts related to string, language, grammar and their properties	Understanding
CO2	Examine and Construct different grammars, regular expressions and relate the languages defined by different grammars and regular expressions.	Applying
CO3	Design Finite Automata, PDA, Turing Machine to recognize different languages.	Creating

Module	**Module Contents**	**Hours**
I	Types of Proofs, Mathematical Induction and Recursive definitions, Regular expressions & corresponding regular languages, examples and its applications, unions, intersection & complements of RL, Pumping Lemma for RL.	6
II	Deterministic finite automata definition and representation, Nondeterministic F.A., NFA with ^ transitions, Equivalence of DFAs, NFAs and NFA-^s. Kleene's theorem & proofs, minimum state FA for a regular language, minimizing number of states in an FA.	10
III	Definition and types of grammars and languages, derivation trees and ambiguity, CFL's & Non CFL's., Union, Concatenation and Kleene's operations, Intersection and complements of CFLs, Pumping Lemma & examples.	6

IV	Definition, deterministic PDA, types of acceptance and conversions to each other, CFGs & PDAs, Top-Down, & Bottom-up parsing.	6
V	BNF, CNF and GNF notations, Eliminating ^ production and unit productions from a CFG, Eliminating useless variables from a Context Free Grammar.	4
VI	Models of computation, definition of TM as Language Acceptors, Combining Turing Machines, computing a function with a TM. Variations in TM, TMs with doubly-infinite tapes, more than one tape, Nondeterministic TM and Universal TM.	7

Text Books	
1	John C. Martin, "*Introduction to Languages & Theory of Computation*", Tata McGraw-Hill , 3rd Ed., 2009
2	John E.Hopcraft, Rajeev Motwani, Jeffrey D. Ullman, "*Introduction to Automata Theory, Languages and Computations*", Pearson Edu., 3rd Ed., 2009
3	Daniel I. A. Cohen, *"Introduction to Computer Theory*", Wiley, 2nd Ed., 2008

References	
1	J.P.Tremblay & R.Manohar, "*Discrete Mathematical Structures with Applications to Computer Science*", Tata McGraw-Hill, 2008
2	K.L.P. Mishra & N. Chandrasekaran, "*Theory of Computer Science*", PHI, 2nd Ed., 2002
3	Vivek Kulkarni, "*Theory of Computation*", Oxford University Press, 1st Ed., 2013

Useful Links	
1	Introduction to Automata theory - YouTube
2	Mod-01 Lec-01 Introduction - YouTube

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

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	10	30	50
3	Apply	10	5	20	35
4	Analyze				
5	Evaluate				

6	Create		5	10	15
Total		**20**	**20**	**60**	**100**

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Operating Systems
Desired Requisites:	Nil

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To introduce students with basic concepts of operating system, system software, threads and their communication
2	To familiarize the students with various views and management policies adopted by O.S. as pertaining with processes , Deadlock , memory , File and I/O operations.
3	To provide the knowledge of basic concepts towards process synchronization, Mutual exclusion algorithms and deadlock detection algorithms and related issues.
4	To inculcate importance of memory management, storage management and I/O device management in OS design.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Describe the primitive concepts of Operating System services and system software functionality.	Understand
CO2	Illustrate Process management, Memory management, Storage management and I/O management core techniques in effective execution of processes.	Apply
CO3	Assess various algorithms of Process, Memory, Storage & I/O management for performance and quality criterion.	Evaluate
CO4		

Module	**Module Contents**	**Hours**
I	**Overview of Operating System** Notion of operating systems ,Operating system services, user operating system interface, system calls, types of windows and UNIX system calls, system programs, operating system design and implementation, operating system structure, Virtual Machines Case Study : Windows and UNIX Operating System	6
II	**System Softwares**	6

	Notions of editors, Macro processors, Compilers, Assemblers, loaders & linkers, Multiprogramming and time sharing.	
III	**Process Management** **Process Concept :** Process concept, process scheduling, operation on process, inter-process communication, example of IPC systems and communication in client-server systems. **Process Scheduling:** Basic concepts, scheduling criteria, scheduling algorithm, algorithm evaluation.	7
IV	**Process Coordination** **Synchronization :** Background, the critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of Synchronization. **Deadlock :** System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection.	7
V	**Memory Management** **Memory-Management Strategies :** Background, swapping, contiguous memory allocation, paging, structure of the page table, Segmentation. **Virtual Memory Management :** Background, demand paging, copy-on-write, page replacement algorithms, allocation of frames, Thrashing.	8
VI	**Storage Management** **File System :** File concept, access methods, directory and disk structure, file-system mounting, file sharing, protection.	5

Text Books	
1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", John Wiley, 10th Edition, 2018
2	D. M. Dhamdhere,"Operating Systems A Concept-Based Approach", McGraw-Hill, 3rd edition, 2012

References	
1	Charles Crowley, "Operating System A Design Oriented Approach", McGraw-Hill Education Pvt. Ltd., 2001
2	Achyut S. Godbole, Atul Kahate "Operating System with Case Studies in Unix, Netware and Windows NT", Tata McGraw Hill,3rd edition, 2010
3	D.M.Dhamdhere, "System Programming and Operating Systems", Tata McGraw - Hill, 2nd Edition, 1999

Useful Links	
1	https://nptel.ac.in/courses/106/108/106108101/
2	https://www.javatpoint.com/os-tutorial

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

CO2	3	2											2		
CO3	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.

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	10	20	40
3	Apply	10	5	20	35
4	Analyze				
5	Evaluate		5	20	25
6	Create				
Total		**20**	**20**	**60**	**100**

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Database Engineering
Desired Requisites:	Data Structures

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To Impart various functional components of database design, manipulation and access language, redundancy issue, storage strategy, transaction and concurrency strategy and its security and recovery system.
2	To Introduce a physical and logical database designs, database modelling, relational, hierarchical and network models.
3	To Provide in depth understanding of relational model and the theoretical issues associated with relational database design.
4	To Exemplify various SQL clauses of Data manipulation, Data access and Data control.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Explain concepts of conceptual database design, redundancy problem, storage system, transaction processing, concurrency control and security in DBMS	Understanding
CO2	Apply theoretical knowledge to design ER diagram, prepare relational schema using appropriate constraints and normalization for a given specification of the requirement	Applying
CO3	Construct SQL queries for Open source and Commercial DBMS for a given specification schema to fetch essential data	Applying

Module	Module Contents	Hours
I	**Introduction and Database Modelling using ER Model** **Introduction:** General introduction to database systems, its advantages and applications, Database System Architecture, Database users and Administrator, Data models, Database management system, Database languages, View of Database, Data Models. **ER Model:** Entity set, Entity types, attributes, Notations, Relationship sets, Relationship types, Keys- super key, candidate key, primary key, Extended Features of ER Model- Generalization, Specialization and aggregation	6
II	**Relational Model and SQL** **Relational Model:** Structure of Relational Database, Reduction of ER model into Relational schemas, Schema-instance distinction, Referential integrity and foreign keys, Relational algebra, Tuple relation calculus, Domain relational calculus, Example queries, **SQL:** Introduction to SQL, Data definition statements with constraints, Insert, Update and Delete, Set Operations, Aggregate functions group by and having clauses, Nested Queries, Views, Complex Queries, Joins.	8
III	**Relational Database Design** Importance of a good schema design, Motivation for normal forms, Atomic domains and 1NF, Dependency theory - functional dependencies, Closure of a set of FD's, Definitions of 2NF, 3NF and BCNF, Decomposition algorithms and desirable properties of them, Multi-valued dependencies and 4NF, Join dependencies and definition of 5NF, Temporal Functional Dependencies	7
IV	**Data Storage and Indexing** File organization, Organization of records in files, Data Dictionary, Database Buffer, and Indexing: Concept, Ordered Indices-Primary, Secondary, Multilevel, B+ Tree Index, Hashing, Hash Indices, Dynamic hashing, Multiple key access, Bitmap Indices.	6
V	**Transaction Processing and Concurrency Control** **Transaction Processing:** Concept, ACID properties, Transaction states, Storage Structure, Implementation of atomicity, isolation and durability, Serializability, Testing for serializability. **Concurrency Control:** Lock-based protocols, Timestamp - based Protocols, Validation – based Protocols, Multiple Granularities, Deadlock handling.	7

VI	**Database security and Recovery System** Authentication, Authorization and access control, Discretionary Access Control (DAC), Mandatory Access Control (MAC) and Role of the Database Administrator (RBAC) models, Intrusion detection, SQL injection. Failure classification, Recovery and Atomicity, Log based recovery, Checkpoints, Shadow Paging, Buffer management in crash recovery.	5

Text Books	
1	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", Mc-Graw Hill New York Publications, 6th Edition, 2011

References	
1	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Mc-Graw Hill New York Publications, 3rd Edition, 2003
2	Ramez Elmasri and Shamkant Navathe, Benjamin Cummings, "Fundamentals of Database Systems", 3 rd Edition, 1999 / later
3	Bipin c. Desai "An Introduction to Database System", Galgotia Publications, 2nd revised edition

Useful Links	
1	https://www.geeksforgeeks.org/
2	https://nptel.ac.in/courses/106/105/106105175/

CO-PO Mapping

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

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	5	5	20
3	Apply	10	15	25	50
4	Analyze			30	30
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Computer Network
Desired Requisites:	Data Communication

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To recall protocol functions and issues related to the Data Link layer.
2	To explain the features and operations of various protocols in TCP/IP suite
3	To elaborate the design and configuration of various networking protocols

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Articulate networking basics and different layers in networking models	Understanding
CO2	Examine the features and operations of protocols of data Link Layer, Network layer, transport layer and Application Layer.	Applying
CO3	Categorize and compare networking protocols.	Analyzing

Module	**Module Contents**	**Hours**
I	**Networking Basics** Evolution of network, Introduction to Computer Networks, Types of Network, Physical & Logical Topology, and Introduction to different types of network, internetworking, Intranet, Internet and revisit to Reference models-OSI, TCP/IP.	4
II	**Data Link Layer** The Channel Allocation Problem-Static and Dynamic Allocation, Multiple Access Protocols-ALOHA, CSMA, CSMA/CD, WDMA, WLAN. Ethernet-cabling, coding, MAC Protocol, Binary exponential back off algorithm, performance, switched Ethernet, fast Ethernet, gigabit Ethernet. Wireless LANs-802.11 stack, physical layer, MAC, frame structure Bluetooth-architecture, application, protocol stack, Data Link Layer Switching- Bridge, hub, repeater, switch, router, gateways, VLAN.	8
III	**The Network Layer** Logical Addressing: IPv4 addresses , IPv6 addresses, internetworking, IPv4, IPv6, transition from IPv4 to IPv6, Address Mapping, ICMP, IGMP, Unicast and Multicast Routing, Numerical problems on logical addressing	7
IV	**The Transport Layer** Process-to-process delivery, user datagram protocol (UDP), TCP, SCTP, Socket Programming	7

V	**Congestion Control and Quality of Service** Congestion, congestion control, congestion control in TCP, introduction to queuing theory, quality of service, techniques to improve qos, integrated services, differentiated services	6
VI	**Application Layer** Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP	7

Text Books	
1	Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 4th/5th edition, 2017
2	William Stallings, "Data and Computer Communications", Prentice Hall (PHI) , 8th/9th edition, 2010/2011
3	Andrew S. Tanenbaum, "Computer Networks", Prentice Hall (PHI), 3rd /5th Edition, 2008/2010

References	
1	James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education,5th /6th edition, 2012/2013
2	Thomas G. Robertazzi , "Computer Networks and Systems: Queueing Theory and Performance Evaluation", Springer, 2nd edition, 2000

Useful Links	
1	Nptel Course: Link
2	Udemy Course: Link

CO-PO Mapping

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

1:Low, 2:Medium, 3:High

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	5	10	25
3	Apply	10	10	25	45
4	Analyze		5	25	30
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Database Engineering Lab
Desired Requisites:	Data Structures

Teaching Scheme (Hrs)		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2				
Interaction	-	**Credits: 1**			

Course Objectives

1	To elaborate use of conceptual database designs to prepare database schemas, indexing, transaction processing, concurrency and recovery control issues associated with database management systems
2	To make the students aware of various relational database systems and the systematic approach to apply theoretical knowledge to design practical applications to solve real world problems on the small scale
3	To make the students understand SQL and to use it efficiently to retrieve data from the database.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Interpret the problem statement of an enterprise, identify the need, analyse the problem and design ER diagram for the enterprise as well as prepare the relational database schema for the enterprise identifying integrity constraints for efficient design using modern tools.	Apply
CO2	Apply systematically theoretical knowledge to design practical applications to solve real world database problems on the small scale and theoretically justify the design and use fundamental transaction processing, concurrency control etc. in real applications.	Apply
CO3	Compare and use various ways of writing the queries for a given problem and extract required information from the database.	Analyze

List of Experiments / Lab Activities

List of Experiments:

1. Database Design using ER model
2. Database schema design
3. Database creation and applying integrity constraints
4. Study of DDL statements and data manipulation statements
5. Study of Basic SQL SELECT statement for displaying data from single table or multiple tables
6. Study of SQL constructs for aggregating data using group functions, sub-queries and complex queries
7. Study and Implementation of Triggers
8. Study and Implementation of Stored Procedures
9. Transaction isolation levels and Concurrency control
10. Few aspects of authorization such as creating and managing users, roles, granting and revoking of privileges
11. Implementation of B+ tree, hash index in C or C++

Text Books	
1	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", Mc-Graw Hill New York Publications, 6th Edition, 2011
References	
1	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Mc-Graw Hill New York Publications, 3rd Edition, 2003
2	Ramez Elmasri and Shamkant Navathe, Benjamin Cummings, "Fundamentals of Database Systems", 3 rd Edition, 1999 / later
3	Bipin c. Desai "An Introduction to Database System", Galgotia Publications, 2nd revised edition
Useful Links	
1	https://www.geeksforgeeks.org/
2	https://nptel.ac.in/courses/106/105/106105175/

CO-PO Mapping

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30

Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand	5		5	**10**
Apply	15	15	20	**50**
Analyze	10	15	15	**40**
Evaluate				
Create				
Total Marks	**30**	**30**	**40**	**100**

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Computer Network Lab
Desired Requisites:	Data Communication

Teaching Scheme (Hrs)		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2				
Interaction	-	**Credits: 1**			

Course Objectives

1	To dig up theoretical and practical knowledge in computer networks.
2	To distinguish and show how to design and analyze different types of communication protocols.
3	To interpret basic skills needed to write network application using socket interface.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Demonstrate the practical aspect of networking related to the theoretical concepts.	Applying
CO2	Simulate, configure and analyze the network using networking tools.	Analyzing

List of Experiments / Lab Activities

List of Experiments:

At least 10 to 12 assignments should be conducted on following topics:

1. Study of Internetworking devices.
2. Study of basic networking commands and network configuration.
3. Study of packet capturing and analyzing tools on windows platform(e.g. Wireshark)
4. Wireshark Lab: Ethernet
5. Wireshark Labs:ARP.
6. Wireshark Lab: 802.11
7. Configuration of network topology using packet tracer tool
8. Configuration of routing protocols
9. Configuration of IPv6 address using Packet Tracer
10. Capture and analyze TCP and UDP packet using Wireshark
11. Analyzing TCP connection and termination using Wireshark
12. Socket programming using TCP and UDP.
13. Wireshark Lab: HTTP
14. Wireshark Labs: DNS

Text Books	
1	Richard Steven, "Unix network programming", for Socket Programming, Prentice Hall ,3rd edition, 2015
2	James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education,5th /6th edition, 2012/2013

References	
1	Jeffery S. Beasley, "Networking", New Riders Press, 2nd edition, 2008.
2	Larry L. Peterson, Bruce S. Davie "Computer Networks: A Systems Approach", The Morgan Kaufmann Series in Networking, 5th edition, 2011.

Useful Links	
1	Nptel Course: Link
2	Udemy Course: Link

CO-PO Mapping

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	10	10	15	**35**
Analyze	20	20	25	**65**
Evaluate				
Create				
Total Marks	**30**	**30**	**40**	**100**

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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Programming Lab 2
Desired Requisites:	Object Oriented Paradigm, Object Oriented Concept and basic implementation in C++.

Teaching Scheme (Hrs)		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2				
Interaction	-	**Credits: 1**			

Course Objectives

1	To inculcate the understanding of JAVA programming environment, basic object oriented programming with JAVA (JAVA version 1.8 and above or the latest java version)
2	To introduce selection of appropriate concepts of java programming such as static and non-static classes and access modifiers, user defined classes, collection, interface, exception handling, multi-threading, packages like – i/o, util, net, jdbc etc.
3	To infuse skills of integrating all components to build small java application for real world problem.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Convert the real world problem using simple java programing domain and identify the required java object oriented concept	Understanding
CO2	Demonstrate small application using java as a programing language for socio economic importance	Applying

List of Experiments / Lab Activities

List of Experiments:

1. Installation of jdk package, understand the difference between jdk and jre folder, set environment variable PATH/CLASSPATH.
2. Simple hello word program for understanding – java structure, command and steps for executing java program. Also simple program for reading input from user using scanner class.
3. Implementation of different inheritance types, Multiple Inheritance using Interface design combinational and sequential circuit.
4. Implementation of Package and access mechanism in package
5. String class implementation, basic operation, creating immutable and mutable string
6. Exception Handling
7. Implement collection utility classes – list, set, map with their specific methods available in interface or implemented class.
8. Implement exception related to IO and collection classes.
9. Program to read basic data types from keyboard using Scanner and check the entered values data type for its appropriateness
10. Multithreading – display thread information.
11. Multithreading – create thread using Thread and Runnable class.
12. Multithreading – thread communication and synchronization of threads.
13. Design Database program for Employee details and implement INSERT, SELECT, DELETE, and UPDATE queries.
14. Implement ResultSet class.
15. Implement RowSet class.
16. GUI design and Event handling
17. GUI design using Swing package - a) Celsius to Fahrenheit conversion b) Login and Password Verification.
18. Implement exception related to event handling, GUI design.

Text Books	
1	Cay S. Horstmann, Gary Cornell "Core Java Fundamentals Volume –I" (The Sun Microsystems Press Java Series), 10th Edition, March 2016.
2	Cay S. Horstmann, Gary Cornell, "Core Java Volume – II" (The Sun Microsystems Press Java Series), 10th Edition, April 2017
References	
1	Herbert Schildt, "Java Complete Reference", McGraw Hill Education, 10th Edition, November 2017
2	Kathy Sierra and Bert Bates, "Oracle Certified Associates JAVA Standard Edition 8 Programmer I Exam Guide", McGraw Hill Education (Oracle Press), May 2017
3	Kathy Sierra and Bert Bates, "Oracle Certified Associates JAVA Standard Edition 8 Programmer II Exam Guide", McGraw Hill Education (Oracle Press), July 2018
Useful Links	
1	

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	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	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.

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand	15	15	15	**45**
Apply	15	15	25	**55**
Analyze				
Evaluate				
Create				
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Presentation and Report Writing
Desired Requisites:	Basic presentation skills

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	1 Hrs/week	**Credits: 1**			

Course Objectives		
1	enable students to express them with confidence	
2	enable students to create PPT for seminar	
3	enable students to search project topic	
4	enable students to create and present report	
Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Demonstrate presentation skills	Apply
CO2	Interpret self -introduction skills	Apply
CO3	Judge Report writing skills	Evaluate
CO4	Identify skills of PPT creation and presentation	Create

List of Experiments / Lab Activities

List of activity/assignments:

1. Video Resume
2. Seminar
3. Synopsis writing
4. Presentation, Etc.

Text Books	
1	How to write technical reports by Springer

References	
1	IEEE publications
2	Overleaf for Latex

Useful Links	
1	https://www.researchgate.net
2	https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes
3	https://www.elsevier.com/en-in
4	https://ieeexplore.ieee.org/Xplore/home.jsp

CO-PO Mapping

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

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		T1	T2	ESE	Total
1	Remember				
2	Understand				
3	Apply	15	10	20	45
4	Analyze				
5	Evaluate	5	5	20	30
6	Create		5	20	25
Total		**20**	**20**	**60**	**100**

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

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	20	20	60	100
3	Apply				
4	Analyze				
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

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AY 2021-22

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	
Course Name	Environment Science
Desired Requisites:	-Nil-

Teaching Scheme		Examination Scheme (Marks)			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 0**			

Course Objectives	
1	Infuse an understanding of the various environmental concepts on scientific basis in the functional area of Engineering and technology.
2	Provide a foundation to critically assess the approaches to pollution control, environmental and resource management, sustainable development, cleaner technologies, Environmental Legislation based on an understanding of the fundamental, environmental dimensions.
3	Inculcate the modern concept of green industry and the impact of excess human population, globalization, and climate change on the environment.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Describe key concepts of Environmental science and their relationship to engineering.	Understanding
CO2	Explain ethical and legal responsibility of an engineer and his role in effective implementation of sustainable activities through EIA and EMS in the corporate sector.	Understanding
CO3	Predict impact of contemporary issues (Population Explosion, Climate change, Environmental pollution) on the environment.	Understanding

Module	Module Contents	Hours
I	**Environment, Ecology and Biodiversity** *Introduction*: Natural and Built Environment, *Environmental Education*: Definition, Scope, Objectives and importance. *Components of the Environment*: Atmosphere, Hydrosphere, Lithosphere and Biosphere. *Ecology*: Introduction, Classification of ecosystems, Structure and functions of ecosystems, Trophic levels, Food chains, Food webs, Ecological pyramids, Ecological succession, Biogeochemical cycles. *Biological Diversity*: Introduction, Values of biodiversity, Hotspots of Biodiversity, Threats to biodiversity, Conservation of biodiversity.	7

II	**Human Population, Energy and Natural Resources** *Human Population Growth and Environment*: Population Dynamics, Age structures, *Energy Scenario*: Future projections of Energy Demand, Utilization of various Energy Sources, Conventional Energy Sources and Non- Conventional Energy Sources, Urban problems related to energy. *Natural Resources*: Food, Water, Forest, Geological, Equitable Use of Resources for Sustainable lifestyle. Case studies.	5
III	**Climate Change, Environmental Quality and Pollution Control** *Climate change*: Global warming, Ozone depletion, Acid Rain. *Environmental Impact*: Impact of Modern agriculture on the Environment, Impact of Mining on the Environment, Impact of Large dams on the Environment. *Environmental pollution*: Air, Water, Soil, Noise, Marine, classification of pollutants, their causes, effects and control measures. Case studies.	5
IV	**Solid, Hazardous Waste and Disaster Management** *Solid and Hazardous waste management*: Introduction, categories, causes, effects and management of municipal solid waste, Hazardous waste *Disaster Management*: Introduction, types of disasters, Disaster mitigation. Case studies.	4
V	**Social Issues, Environmental Management and Legislation** *Environmental ethics*: Introduction, Ethical responsibility, issues and possible solutions. *Environmental Management*: Introduction to Environmental Impact Assessment, Environmental Management System: ISO 14001Standard, Environmental Auditing, National and International Environmental protection Agencies pertaining to Environmental Protection. *Environmental Legislation*: Environmental Protection Act 1986, Water (prevention and control of pollution) Act 1974, Air (prevention and control of pollution) Act 1981, Wildlife Protection Act 1972, and Forest Conservation Act 1980. Municipal Solid Wastes (Management and Handling) Rules, 2000.	4
VI	**Cleaner technology** Restoration Ecology, Role of Information Technology in Environment science, Green buildings, Green products, Consumerism and Waste Products, Minimization of Hazardous Products, Reuse of Waste, By-products, Rainwater Harvesting, Translocation of trees. Some Success Stories. Case studies.	3
Text Books		
1	Mrinalini Pande, "Disaster Management", Wiley Publications New Delhi, First edition, 2014	
2	N.K Uberoi, "Environmental Studies", Excel Books Publications New Delhi, first edition, 2005.	
3	R.Rajagopalan, "Environmental Studies from crisis to cure" Oxford university press, second edition, 2011	
References		
1	William. Cunningham and Barbara Woodworth Saigo, "Environmental Science: A Global Concern", WCB/McGraw Hill publication, 5th Edition, 1999.	
2	Peter. H. Raven, Linda. R. Berg, George. B. Johnson, "Environment", McGraw Hill publication, 2nd -Edition, 1998.	
3	Catherine Allan & George H. Stanley (Editors), "Adaptive Environmental Management", Springer Publications. 2009.	
Useful Links		
1	https://www.youtube.com/watch?v=1Ht2uwDh6ro	

2	https://www.youtube.com/watch?v=bvXrL5shxO4&list=PLSsIp6g3OZyVZgG0imE46NCXH3iwvD9SF
3	https://www.youtube.com/watch?v=ZngDF4jfRdw&list=PLyqSpQzTE6M_vO7rLpxKZWqai4uJP2bDa
4	https://www.youtube.com/watch?v=mIPBPG-5dUw