Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7CS201
Course Name	Computer Organization and Architecture
Desired Requisites:	Basic Electronics Engineering

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

Course Objectives	
1	To introduce the organization and architecture of computers.
2	To familiarize the memory organization architecture.
3	To present the basic concepts of execution speedup by pipelining.
4	To enable use of organization concepts for 8085 microprocessor.

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 classic computer architectures, microprogrammed control, memory organization, I/O and pipelining	II	Understanding
CO2	examine organization concepts such as control and arithmetic design, memory hierarchy, I/O and pipelining	III	Applying
CO3	use organization concepts for 8085 microprocessor	III	Applying
CO4	compare classic architectures, memory addressing modes, types of I/O interfaces and pipelining concepts	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction to computer organization and architectures** Introduction, Von Neumann Architecture, Harvard architecture, Memory locations & addresses, memory operations, addressing modes, encoding of machine instructions. **Arithmetic design** Design of signed multiplication, Booth's algorithm, bit-pair recording, division, floating point numbers and operations, guard bits and rounding.	8
II	**Control design** Execution of a complete instruction, sequencing of control signals, micro programmed control, microinstruction format, microinstruction sequencing, and bit slice concept.	7
III	**Memory hierarchy** Computer memory organization, RAM/main/primary memories, Read Only memories, cache memories, mapping functions, replacement algorithms,	7

	performance consideration: Multimodal memories & interleaving, hit rate & miss penalty, multilevel cache organization, virtual memories, address translation, memory management requirement.	
IV	**I/O interface** Input-output organization, I/O mapped I/O and memory mapped I/O, Direct Memory Access (DMA), interrupts and interrupts handling mechanisms, device identification, vectored interrupts, interrupt nesting, I/O interfaces, synchronous vs. asynchronous data transfer, I/O channels	7
V	**Pipelining** Basic concepts in pipelining, data hazards, instruction hazards, influence of pipelining on instruction set, data-path & control considerations, performance considerations, and Fyn's classification of computer architectures.	5
VI	**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.	6

Textbooks	
1	William Stallings. "Computer Organization and Architecture: Designing for Performance". Pearson Education, 8th Edition/10th Edition, 2010/2016
2	J. Hayes , "Computer Architecture and Organization", McGraw Hill, 3rd edition, 2017
3	Ramesh S. Gaonkar. "Microprocessor architecture, programming & applications", Penram International publications (India) Pvt. Ltd. 6th edition, 2013
References	
1	David A. Patterson and John L. Hennessy "Computer Organization and Design: The Hardware/Software Interface", Elsevier, 5th Edition, 2013
2	N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah. "Microprocessors and Interfacing", Oxford Higher Education, 1st Edition, 2012
Useful Links	
1	https://www.udemy.com/course/computer-organization-and-architecture-j/?couponCode=LEADERSALE24B
2	https://nptel.ac.in/courses/106106166

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	
CO2	3	1							2	1			2	
CO3	3	1							2	1			1	
CO4	2	2							1				1	

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. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7IK201
Course Name	Introduction to Ancient Indian Technology
Desired Requisites:	General curiosity, maturity expected from adult student.

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

Course Objectives

1	The course is designed for undergraduate students, interested in learning about the ancient Indian technology which is the hallmark of glorious Indian civilization.
2	The objective is to emphasize on nature centric aspects of ancient Indian technologies that can be adopted in modern time.
3	The course is to expose the students to ancient science and technologies which can be adopted for modern technological 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	name the ancient Indian technological achievements	II	Understanding
CO2	comprehend the concept of Indian traditional knowledge and its relevance	III	Applying
CO3	explain the Indian contribution to the world at large	III	Applying
CO4	judge the ancient Indian technology.	IV	Analysing

Module	**Module Contents**	**Hours**
I	Introduction: Why are ancient Indian science and technology relevant today? What is science? How is it different from technology? .	4
II	Philosophy of ancient Indian technology, how is different from modern technology? Ancient Indian Scientific methods. Glimpses of ancient Indian science and technology?.	4
III	Material technology in ancient India : Mining, Metals and Metallurgy, Iron Making and craftsmanship, Wootz Steel Technology	5
IV	Extraction of Zinc in ancient India, Glass making, Bead making Techniques, Ceramic Technology.	4

V	Water Harvesting Technology, Irrigation Systems. Town planning, Building construction, Sanitation from ancient India period.	5
VI	Agriculture and Textile Technology in context of ancient India i.e. Bharat.	4

Textbooks	
1	Transcript of the NPTEL course available at https://archive.nptel.ac.in/courses/101/104/101104065/. Title of the course “Introduction to Ancient Indian Technology” by Prof. D.P. Mishra Department of Aerospace Engineering, IIT Kanpur
References	
1	The NPTEL course available at https://archive.nptel.ac.in/courses/101/104/101104065/. Title of the course “Introduction To Ancient Indian Technology” by Prof. D.P. Mishra Department of Aerospace Engineering, IIT Kanpur
Useful Links	
1	https://archive.nptel.ac.in/courses/101/104/101104065/

CO-PO Mapping

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

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. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7EE201
Course Name	Understanding Incubation and Entrepreneurship
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	03Hrs/week	LA1	LA2	ESE	Total
Tutorial	-	30	30	40	100

Credits: 3

Course Objectives

1	To familiarize the entrepreneurial framework and the start-up projects which help students to navigate through their own entrepreneurial journey.
2	To develop an entrepreneurial mind-set thereby encouraging the journey of transformation to convert an idea or a solution into a business

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	Translate creative ideas into a sustainable business opportunity	II	Understanding
CO2	Apply principles and practice of new entrepreneurial venture planning to assess a business idea	III	Applying
CO3	Differentiate among types of Business Models	IV	Analysing
CO4	Evaluate decision making towards establishing enterprises in real life situations	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to Entrepreneurship**	7

	Hand holding for Entrepreneurship GDC start-up stories, The Entrepreneurial Mind-Set , Corporate Entrepreneurship , Generating and Exploiting New Entries	
II	**Innovation and Entrepreneurship Types** Methodology for Innovation, Team Building, Problem Statement Presentation	6
III	**The Innovation Process** Innovation and Entrepreneurship, Solar Oven case-study Paradigm shift from Design to Entrepreneurship, Bio- Med Innovation and Entrepreneurship, Healthcare and Innovation, Human Centered Innovation, Success Stories	7
IV	**Introduction to Incubators** Business Model Canvas, Technology led Entrepreneurship, Introduction to SINE Incubator, Lean Model Canvas SINE, Start-up Stories:	7
V	**From Corporate to Entrepreneurship** Creativity and Generating Product Ideas, From Idea to Proof of Concept, Network Entrepreneurship	7
VI	**Case Study** Learning from examples Start-up PITCHES - Using Lean Canvas Model	6
Textbooks		
1	Disciplined Entrepreneurship: 24 Steps to a Successful Startup by Bill Aulet	
2	The Essence of Medical Device Innovation by B Ravi	
3	THE FORTUNE AT BOTTOM OF PYRAMID: Eradicating Poverty Through Profits by C.K.Prahalad Stay Hungry	
References		
1	Stay Foolish by Rashmi Bansal	
2	The Entrepreneurial Connection: East Meets West in the Silicon Valley by Gurmeet Naroola	
3	Innovation By Design: Lessons from Post Box Design & Development by B. K. Chakravarthy , Janaki Krishnamoorthi	
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		3												
CO2			3											
CO3			3											
CO4								3	3	3	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

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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Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7CS202
Course Name	Discrete Mathematics
Desired Requisites:	Mathematics-(Boolean operations, logical operations)

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

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	explain logical notation to define and reason about fundamental mathematical concepts of logic theory, set theory, relations, probability, counting techniques.	II	Understanding
CO2	solve problems of POSET, Hasse diagram, groups, semigroup and monoid	III	Applying
CO3	analyze various relations and its types, functions and different algebraic structures.	IV	Analyzing
CO4	analyze concepts and algorithms of graph theory and elementary combinatorial processes such as permutations and combinations.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Mathematical Logic & Set Theory** Introduction, Statement and Notation, Connectives, statements formulas and truth tables, Tautologies Equivalence of formulas, other connectives, Basic concepts of set theory, Venn Diagram, set operation, algebra of sets.	8
II	**Relations and Functions** Relations, Pictorial representation of Relations, Properties of binary relation, Equivalence Relations, partition and covering of set, POSET and Hasse Diagram, Lattice. Functions: Definition, Domain, Range, Image, etc. Types of functions: Surjection, Injection, Bijection, Inverse	8

III	**Algebraic structures** Basics of Modulo Arithmetic, Introduction, Operations, semigroups, Groups, subgroups, Rings, monoid, Codes and Group codes	5
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, planar graph , independent sets, coloring	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 of graph	5
VI	**Counting** Basic counting techniques – inclusion and exclusion, Rules of sum and product, permutations, combinations, Basic Counting Techniques (sum, product, subtraction, division, exponent), Pigeonhole and Generalized Pigeonhole Principle with many examples	6

Textbooks	
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	Seymour Lipschutz,Mar Lipson "Discrete Mathematics:Schaum's Outlines Series",Schaum's outline series.,3rd edition, 2009
2	K.D. Joshi, "Foundation of Discrete Mathematics ", New Age International Ltd., 1 st edition,2014
Useful Links	
1	NPTEL: https://youtu.be/Lj9Awpd5ltc
2	NPTEL: https://youtu.be/BYD9yLHQdBs

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	-
CO2	3	2	-	-	-	-	-	-	2		-	-	2	-
CO3		3	-		-	-	-	-	2	-	-	-	2	-
CO4		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. (Computer Science Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7CS203
Course Name	Data Structure
Desired Requisites:	Programming in C including structures, pointers and File Handling

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/Week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
Practical	-	**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 solving a given problem.
3	To provide a foundation to analyse and compare various searching and sorting techniques and to select optimal techniques to solve the problem.

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 linear and non-linear data structures with ADTs, searching ,sorting and hashing techniques.	II	Understanding
CO2	demonstrate use of data structures and apply it to solve the problems.	III	Applying
CO3	compare and analyse data structure algorithms, searching and sorting methods in terms of asymptotic notation.	IV	Analyzing
CO4	select appropriate data structure, searching, sorting method, algorithm for any practical problem.	V	Evaluating

Module Contents

I	**Basic Concepts** Algorithm, Pseudocode, ADT, Data Structure, Algorithmic Efficiency, Asymptotic Notations, 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, Shortest Path Algorithm.	5
VI	**Searching & Sorting Technique** Searching: Importance of searching, Sequential, Binary, Fibonacci search algorithms Sorting: Internal and External Sorts, Insertion, Heap, Quick sort, Merge sort, Radix sort Hashing: Hashing functions, overflow handling with and without chaining,open addressing: linear, quadratic, rehashing	9

Textbooks	
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
4	Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein “Introduction to Algorithms” Third Edition, 2009,The MITPress Cambridge.

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	-	-	-	-	-	-	-	-	-	-	-	2	1
CO2	2	3	2	-	-	-	-	-	1	1	-	-	3	1
CO3	2	3	2	-	-	-	-	-	1	1	-	-	3	1
CO4	2	2	2	2	-	-	-	-	-	-	-	-	3	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, and preferably to only 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. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech, SEM III
Course Code	7CS204
Course Name	Computer Network
Desired Requisites:	Hardware and networking essentials

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

Course Objectives

1	To elaborate various features and operations of networking.
2	To inculcate protocol functions and issues related to each layer of the network model.
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,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	articulate and elaborate networking basics and different layers in networking models	II	Understanding
CO2	examine and illustrate the features and operations of protocols of data Link Layer, Network layer, transport layer and Application Layer.	III	Applying
CO3	categorize and compare networking functionalities of protocols under a given scenario.	IV	Analyzing
CO4	analyse and interpret different fields of the packets/frames of protocols and conclude their implication	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Networking Basics** A Communications Model, Data Communications, Networks, The Internet- An Example, Data communication Concepts and Terminology: Analog and Digital Data Transmission, Transmission Impairments, types of media, Store-and-forward and circuit switching, layered network architecture, the OSI network model,TCP-IP Protocol suite introduction	5

II	**Encoding techniques** Digital Data- Digital Signals, Digital Data- Analog Signals, Analog Data- Digital Signals, Analog Data- Analog Signals. Digital data communication techniques,Numerical problems, Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing	7
III	**Data Link Layer** Data Link Layer and Logical Link Control (LLC) sub-layer: Framing; Error control including Bit- parity, CRC, Stop-and-Wait, Go-back-N, Selective Repeat. Multiple Access Protocols- ALOHA, CSMA/CD Ethernet frame structure Wireless LANs, CSMA/CA, numerical problems	7
IV	**The Network Layer** Logical Addressing: IPv4 addresses, IPv6 addresses, internetworking, NATtransition from IPv4 to IPv6, Address Mapping, ICMP, IGMP, Unicast and Multicast Routing, Numerical problem on logical addressing	7
V	**Transport Layer Protocol** Importance of the transport layer; end-to-end principle,TCP and UDP, process-to process delivery, multiplexing, port numbers, header structure, sequence numbers, ACKs, timeout, TCP connection setup and teardown, Flow control and congestion control at the transport layer	7
VI	**Application Layer** Domain Name Space (DNS),TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP	6
Textbooks		
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	A S Tanenbaum, “Computer Networks”, Pearson Education, ISBN 9788177581652	
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	
2	Behrouz A. Forouzan, Firouz Mosharraf, Computer Networks: A Top-Down Approach, Tata McGraw-Hill Education Pvt. Ltd, ISBN 10: 1259001563 / ISBN 13: 9781259001567	
Useful Links		
1	https://nptel.ac.in/courses/106/105/106105082/	
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	2	1	-	-	-	-	-	-	1	2	-	-	1	-
CO2	3	2	-	-	-	-	-	-	1	1	-	-	1	-
CO3	2	3	-	-	-	-	-	-	1	1	-	-	1	-
CO4	2	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)

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AY 2024-25

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7CS205
Course Name	Software Engineering
Desired Requisites:	Nil

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Grasp industry processes on software development to become IT industry-savvy.	II	Understanding
CO2	practice with the spirit of team-working and importance of using artifacts at SDLC phases.	III	Applying
CO3	Distinguish and evaluate procedural & OO based development practices.	IV	Analysing
CO4	Integrate SDLC phases especially for design and testing of software to undertake industrial strength software projects.	IV	Analysing

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** UML model, UML diagrams: Use-case, Class, Activity, State-chart, Interaction, Sequence, Collaboration, Component, Deployment. Continual integration with Agile model process frameworks.	8
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

Textbooks	
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.
4	Jawadekar W.S., "Software Engineering: principles and practices", Tata McGraw Hills, 1st Edition.

References	
1	Roger S. Pressman, "Software Engineering: Practitioner's Approach", McGraw Hill, 7th Edition, 2010.
2	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
CO1	2		3										3	
CO2			1					2	2	2	2			
CO3														
CO4			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)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7CS251
Course Name	Data Structures Lab
Desired Requisites:	Programming in C including pointers and File Handling

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Lecture	-	30	30	40	100
		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.
4	

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 the concept of recursion, abstract properties of various linear and nonlinear data structures, searching and sorting methods through implementation.	III	Applying
CO2	identify suitable data structures to be used to solve the various problems.	IV	Analyzing
CO3	select appropriate searching, sorting method on the basis of its performance while developing application.	V	Evaluating
CO4	create applications for real-time problems using Data Structures.	VI	Creating

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 hashing

Textbooks	
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	

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				3	3				1	1			2	1
CO2			2	2	2								2	1
CO3			2	2	2								2	1
CO4			2	2	2				1	1			2	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, 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. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7CECS251
Course Name	Community Field Project
Desired Requisites:	Willing to help with gratitude to the community, being patriotic in national development.

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction		30	30	40	100
		Credits: 01			

Course Objectives

1	To realize the dearth of community engagement to engineering aspirants
2	To acquaint with scope, culture and current practices
3	To connect with especially with rural society, administration and NGO for community development
4	To imbibe with programmes of community engagements whole heartedly

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	identify concepts related to community engagement	I	Remembering
CO2	follow practices of community engagement	II	Understanding
CO3	appraise community development principles, connections, schemes in local reach	IV	Analysing
CO4	create a helpful mind-set to help the unprivileged community futuristically	VI	Creating

List of Experiments / Lab Activities/Topic

List of Activities:

- Need of Community connection: Concepts, Moral responsibility, Ethics and Scope of Community engagement
- Community Culture and Practices: Local societal communities, Rural reach-culture, Practice of community engagement
- Community upliftment: Components, Stages, Primitive Principles for development, Utilities and public resources.
- Support Systems: Local Administration, NGO and Community Involvement
- Socialization: Social contribution of community networking, Various government schemes.
- Programs and Government/industrial initiatives of community engagement and their evaluation.

Textbooks	
1	Principles of Community Engagement, 2nd Edition, NIH Publication No. 11-7782, Printed June 2011.
2	Modern-Day Strategies for Community Engagement (Link: - https://amzn.to/3XadlXO)
3	Introduction to Community Development, Theory, Practice, and Service-Learning, Gary Paul Green, Jerry W. Robinson, Jr, 2011
References	
1	https://www.uvm.edu/sites/default/files/community_engagement_handout.pdf (Community Engagement)
2	https://www.atsdr.cdc.gov/communityengagement/pce_concepts.html (Perspectives of Community)
3	https://egyankosh.ac.in/bitstream/123456789/59002/1/Unit1.pdf (community concepts)
4	Israel BA, Coombe CM, Cheezum RR, Schulz AJ, McGranaghan RJ, Lichtenstein R, Reyes AG, Clement J, Burris A. Community-based participatory research: a capacity-building approach for policy advocacy aimed at eliminating health disparities. Am J Public Health. 2010 Nov;100(11):2094-102. doi: 10.2105/AJPH.2009.170506. Epub 2010 Sep 23. PMID: 20864728; PMCID: PMC2951933.
Useful Links	
1	https://youtu.be/bcFe0cj8kUw
2	https://youtu.be/LhaQUb0hX1g
3	https://images.app.goo.gl/VaMNNMEs77XyPMrP7
4	https://www.sewa.org

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	1				1							1	
CO3	1	1				2							1	
CO4						1			1	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, 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. (Computer Science Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7VSCS251
Course Name	Object Oriented Programming
Desired Requisites:	Basic knowledge of programming

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

Course Objectives

1	To provide in-depth coverage of object-oriented programming principles and techniques using C++ and Java.
2	To inculcate the advanced programming concepts in C++ and Java.
3	To use appropriate concepts of java programming such as collection, interface, exception handling, multi-threading, packages etc.
4	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,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Summarize the concepts and usage principles of OOP.	II	Understanding
CO2	Develop the skills to apply concepts of OOP to solve simple problems.	III	Applying
CO3	Investigate and evaluate different OOP concepts to determine their suitability for specific software development projects.	IV	Analyzing
CO4	Design and create solution for real-life applications using OOP concepts.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Program based on creating Class and Object.
2. Program based on constructor and destructor.
3. Implementation of Inheritance and polymorphism.
4. Programs based on use of template, generic template and function.
5. Programs based on namespaces.
6. Installation of jdk package, understand the difference between jdk and jre folder, set environment variable PATH/CLASSPATH.
7. Implementation of Interface and Package.
8. Implementation of Exception Handling.
9. Implement collection utility classes – list, set, map with their specific methods available in interface or implemented class.
10. Implementation of Multithreading.
11. Implementation of database connectivity using JDBC.
12. GUI design and Event handling using Swing.

Textbooks	
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	Cay S. Horstmann, Gary Cornell "Core Java Fundamentals Volume –I" (The Sun Microsystems Press Java Series), 10th Edition, March 2016.
4	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
4	Stanley B. Lippman , "C++ Primer" Pearson , 4th Edition, Jan 2010.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs32/announcements?force=true

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	
CO2				2	2								2	
CO3					3								2	
CO4			3		2			2	3	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, 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.
Class, Semester	Second Year (CSE and IT), Sem IV
Course Code	7MA205
Course Name	Fuzzy Set and Statistics/ Applied Mathematics for CSE
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
Practical	-	**Credits: 3**			

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	2													
CO2	2													
CO3	2													
CO4	2													
CO5	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)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (All Branches)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7AE201
Course Name	Employability Skills Development (ESD)
Desired Requisites:	Nil

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

Course Objectives

1	To improve the problem-solving skills of students.
2	To understand the approach towards problem solving
3	Understanding the sectional cut-offs for different companies

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	Ability to improve the accuracy percentage		
CO2	Understand the current changing recruitment trends		
CO3	Understanding the differential marking scheme in papers		
CO4	Performance improvement in competitive exams like CAT, GATE		

Module	**Module Contents**	**Hours**
I	**Arithmetic I** Ratio, Proportion, Mark Up & Discount, Averages, Mixtures & Alligations, Simple & Compound Interest	6

II	**Arithmetic II** Percentages, Profit & Loss, Time & Work, Time, Speed & Distance, Boat & Streams, Linear Races. **Numbers** Cyclicity, Remainders, Cyclicity of Remainders, Indices, Factors, LCM, HCF.	12
III	**Permutation, Combination, Probability** Fundamental principal of counting, Arrangements, Selection, Grouping, Distribution, Independent Events, Conditional Probability, Binomial Distribution	6
IV	**Logical Reasoning** Clocks, Calendars, Games & Tournaments, Analytical Puzzles, Binary Logic, Blood relations, Directions, Coding, Decoding, Seating Arrangement (Linear, Circular & Rectangular)	6
V	**Verbal Ability I** Vocabulary - Synonyms, Antonyms, Analogies Reading Comprehension, Para Jumbles	6
VI	Verbal Ability II Parts of Speech, Tenses, Subject Verb Agreement	4

Textbooks	
1	Quantitative Aptitude - Abhijit Guha
2	Quantitative Aptitude - Sarvesh Agarwal
References	
1	Quicker Maths - M. Tyra
2	Quantitative Aptitude - Chandresh Agarwal
3	Puzzles to puzzle you - Shakuntala Devi
Useful Links	
1	www.campusgate.co.in
2	www. Lofoya.com
3	www.brainbashers.com

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1											3			
CO2							2							
CO3									3					
CO4										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 the MCQ test which will be conducted online through the platform and it will be a proctored test. No negative marking will be there in the test. Test will be of 60 minutes with 20 questions each on Quantitative Aptitude, Logical Reasoning & Verbal Ability

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (All Branches)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7VE201
Course Name	Value Education
Desired Requisites:	Open mind and a willingness to learn

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

Course Objectives

1	Develop holistic personal and professional skills by enhancing communication, emotional intelligence, and resilience to foster positive relationships and sustainable living practices.
2	Promote ethical and sustainable leadership through the application of integrity, teamwork, and a growth mindset to navigate success and failure while mastering effective presentation and communication skills.
3	Empower lifelong learning and contribution by reflecting on personal values, engaging in critical thinking, and committing to continuous self-assessment and professional development for addressing global challenges.

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	learn effective communication, empathy, and relationship-building skills to foster positive interactions in personal andprofessional settings.	I	Rememberin g
CO2	incorporate sustainable habits into daily life and build resiliencethrough mindfulness and stress management to handle challenges and support environmental stewardship.	II	Understandi ng
CO3	develop goal-setting and achievement strategies, manage success and failure, and deliver impactful presentations for overall personal and professional development.	III	Applying
CO4	strengthen analytical skills and creative problem-solving techniques to make informed decisions and tackle complex issues in various contexts.	IV	Analyzing

Module	**Module Contents**	**Hours**

I	**Interpersonal skills** Introduction to Relationships, Communication Skills, Emotional Intelligence, Conflict Resolution, Maintaining Healthy Relationships	5
II	**Sustainable Living** Introduction to Sustainability, Environmental Impact, Sustainable Practices, Community Involvement, Personal Action Plan	5
III	**Inner Peace and Resilience** Understanding Inner Peace, Mindfulness and Meditation, Stress Management, Building Resilience, Positive Mindset	5
IV	**The Art of Winning** Winning Mindset, Goal Setting, Perseverance and Adaptability, Teamwork and Leadership, Case Studies and Real-life Examples	5
V	**Success and Failure Management** Understanding Success and Failure, Learning from Failure, Growth Mindset, Balancing Success and Failure, Personal Development Plan	5
VI	**The Art of Presentation** Introduction to Presentations, Content Organization, Verbal and Non-Verbal Communication, Practice and Delivery, Feedback and Improvement	5
Textbooks		
1	Stephen R. Covey, *The 7 Habits of Highly Effective People*, Free Press, 25thAnniversary Edition, 2013.	
2	Daniel Goleman, *Emotional Intelligence: Why It Can Matter More Than IQ*, Bantam Books, 10th Anniversary Edition, 2005.	
3	Carol S. Dweck, *Mindset: The New Psychology of Success*, Ballantine Books, UpdatedEdition, 2016.	
4	William McDonough and Michael Braungart, *Cradle to Cradle: Remaking the WayWe Make Things*, North Point Press, 1st Edition, 2002.	
5	Garr Reynolds, *Presentation Zen: Simple Ideas on Presentation Design and Delivery*, New Riders, 2nd Edition, 2011.	
References		
1	Covey, S. R. (1989). *The 7 Habits of Highly Effective People*. Simon & Schuster.	
2	Rosenberg, M. B. (2015). *Nonviolent Communication: A Language of Life*. PuddleDancer Press.	
3	Carnegie, D. (1998). *How to Win Friends and Influence People*. Simon & Schuster.	

4	Covey, S. R. (1989). *The 7 Habits of Highly Effective People.* Simon & Schuster.
5	Rosenberg, M. B. (2015). *Nonviolent Communication: A Language of Life.* PuddleDancer Press.

Useful Links	
1	https://ideas.ted.com/how-to-build-closer-relationships/
2	https://www.nationalgeographic.com/environment/article/sustainable-living
3	https://www.lexisnexis.in/blogs/family-law-in-india/
4	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8937019/
5	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8710473/

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	-	-	-	-	-	2	3	2	2	-	-	2		
CO3	-	-	-	1	-	1	-	2	3	2	2	2		
CO4	-	-	-	3	2	2	2	2	2	2	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 LA1, LA2 and ESE. LA1 shall be typically on modules 1 to 3.
LA2 shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be Tests, assignments, oral, seminar etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 30 - 40% weightage on modules 1 to 3 and 60 - 70% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (LA1+LA2+ESE) are needed and Min. 40% marks in ESE
are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7CS221
Course Name	Operating Systems
Desired Requisites:	Nil

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Describe the primitive concepts of Operating System services and system software functionality.	II	Understanding
CO2	Illustrate Process management core techniques in the zest of effective execution of processes.	III	Applying
CO3	Elucidate Memory management, Storage management and I/O management core techniques in efficient execution of programs to achieve user and system goals.	IV	Analyzing
CO4	Assess various algorithms of Process, Memory, Storage & I/O management for performance and quality criterion.	V	Evaluating

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** Notions of editors, Macro processors, Compilers, Assemblers, loaders & linkers, Multiprogramming and time sharing.	6
III	**Process Management** **Process Concept:** Process concept, process scheduling, operation on process, interprocess 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

Textbooks	
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
3	D.M.Dhamdhere, "System Programming and Operating Systems", Tata McGraw - Hill, 2nd Edition, 1999
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
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
CO1	2		1										2	
CO2	3	2							1	1			3	

CO3	2	3											2	
CO4	2	3							1	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

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7CS222
Course Name	Database Engineering
Desired Requisites:	Data Structures

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	explain concepts of conceptual database design, redundancy problems, storage systems, transaction processing, concurrency control, and security in DBMS.	II	Understanding
CO2	apply theoretical knowledge to design ER diagrams and prepare relational schemas using appropriate constraints and normalization for a given specification of the requirements.	III	Applying
CO3	construct SQL queries for open-source and commercial DBMS for a given specification schema to fetch essential data.	III	Applying
CO4	analyze security & recovery issues of databases.	IV	Analyzing

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
Textbooks		
1	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, McGraw Hill New York Publications, 6th Edition, 2011	
2	Ramakrishnan Database Management Systems 3rd Edition PDF	
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
CO1	2								1	1			3	
CO2	2	2							1	1			2	
CO3	1	1	1						1	1			2	
CO4	1	1	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. 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

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7CS223
Course Name	Formal Language and Automata Theory
Desired Requisites:	Discrete Mathematics

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

Course Objectives	
1	To teach basic terminologies related to formal languages and Automata theory.
2	To provide foundation to critically analyse 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,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	explain the concepts related to string, language ,grammar and their properties	II	Understanding
CO2	demonstrate different grammars, regular expressions and relate the languages defined by respective grammars and regular expressions	III	Applying
CO3	differentiate between distinct formal computing languages and their recognizers.	IV	Analysing
CO4	construct Finite Automata, PDA, Turing Machine to recognize respective languages.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Finite Automata:-**Introduction, Basic concepts, Languages ,Finite State Machine, Finite Automata, Deterministic Finite Automata, Non-Deterministic Finite Automata, Extended Transition Function, Equivalence of NFA and DFA, NFA with ^ transitions, minimum state FA for a regular language, minimizing number of states in an FA.	10
II	**Regular Expressions and Pumping Lemma:-**Regular expressions & corresponding regular languages, examples and its applications, unions, intersection & complements of RL, Pumping Lemma for RL, Kleene's theorem & proofs	6

III	**Context Free Languages:-**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	**Normal Forms and Parsing: -**Normal forms for Context Free Grammars, BNF, CNF and GNF notations, eliminating ^ production and unit productions from a CFG, Eliminating useless variables from a Context Free Grammar. Top-Down, & Bottom-up parsing	6
V	**Push Down Automata:-**Introduction, The definition of Pushdown automata, Deterministic Pushdown automata, PDA and CFG, DPDA vs NPDA	6
VI	**Turing Machine: -**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.	5

Textbooks	
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	Vivek Kulkarni, "Theory of Computation", Oxford University Press, 1st Ed., 2013
4	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
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
CO1	2	-	-	-	-	-	-	-	1	1	-	-	2	-
CO2	2	-	-	-	-	-	-	-	1	1	-	-	3	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-	3	-
CO4	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)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7CS271
Course Name	Database Engineering Lab
Desired Requisites	Data Structures

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

Course Objectives

1	To elaborate use of conceptual database design 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 databases systems and the systematic approach to apply theoretical knowledge to design practical applications to solve real world problems the small scale
3	To make the students understand SQL and to use it efficiently retrieve data from the database.

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	interpret the problem statement of an enterprise, identify the need, analyze the problem, and design an Entity-Relationship (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.	III	Applying
CO2	apply theoretical knowledge systematically to design databases for various applications	III	Applying
CO3	compare and use various methods of writing queries for a given problem	IV	Analyzing

CO4	evaluate and implement database security measures to protect sensitive data from unauthorized access	V	Evaluating

List of Experiments / Lab Activities/Topics	
List of Topics (Applicable for Interaction mode): **List of Lab Activities:** 1. Database Design Using ERmodel 2. Database Schema Design 3. Database Creation And Applying Integrity Constraints 4. Study of DDL statements and data manipulation statements 5. Study Basic SQL SELECT statement for displaying data from single table or multiple tables 6. Study of SQL constructs for aggregating data using group functions, subqueries and complex queries 7. Study and Implementation of Triggers 8. Study and Implementation of Stored Procedures 9. Transaction isolation level and Concurrency control 10. Few aspects of authorization much as creating and managing users, roles, granting and revoking of privileges 11. Implementation of B+ tree, hash index in C or C++	
Textbooks	
1	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, Mc-GrawHill New York Publications, 6th Edition, 2011
References	
1	Raghu Ramakrishnan and Johannes Gehrke, “DatabaseManagementSystems”, Mc-Graw Hill NewYork Publications,3rd Edition,2003
2	Ramez Elmasri and Shamkant Navathe, Benjamin Cummings, “Fundamentals of Database Systems”, 3rd 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
CO1		2	2	2	2				1	1			3	
CO2			2	2	3				1	1			3	
CO3				3									3	
CO4			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, 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 the 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. (Computer Science Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7CS272
Course Name	Web design and Development Lab
Desired Requisites	Basics of web technology, Object oriented programming concepts

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

Course Objectives	
1	To inculcate programming fundamentals required for full stack web development.
2	To introduce concepts of full stack development and web frameworks.
3	To impart skills for selection of appropriate components from state-of-the-art web framework.
4	To infuse abilities to use state-of-the-art technologies to design and development of a dynamic web application.

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	grasp the fundamentals of full stack web development.	II	Understanding
CO2	implement components of state-of-the-art full stack web framework.	III	Applying
CO3	study components of state-of-the-art web framework to fulfil given requirements.	IV	Analyzing
CO4	select suitable web components to retrieve and filter data from the database efficiently.	V	Evaluating
CO5	design and deploy a web application based on given requirements.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Perform programming assignments on data types and looping concepts in Python programming.
2. Perform a programming assignment on collections in Python.
3. Perform a programming assignment on OOP concepts using Python.
4. Installation and creation of a virtual environment for Django.
5. Implement Django syntax for variables, tags, loops, comments, etc.
6. Work with Django models and the database.
7. Create views and templates to display data.
8. Handle forms and validations in Django.
9. Manage static files and media in Django.
10. Implement Querysets and retrieve data using Django.
11. Implement user authentication of Django.
12. Deploy your Django project to a web server.
13. Design a web application based on given requirements.

Textbooks	
1	Vincent, William S. Django for Beginners: Build websites with Python and Django. WelcomeToCode, 2022.
2	Dauzon, Samuel, Aidas Bendoraitis, and Arun Ravindran. Django: web development with Python. Packt Publishing Ltd, 2016.
References	
1	Ghimire, Devndra. "Comparative study on Python web frameworks: Flask and Django." (2020).
2	Kaswan, Kuldeep Singh, Jagjit Singh Dhatterwal, and B. Balamurugan. Python for Beginners. Chapman and Hall/CRC, 2023.
Useful Links	
2	https://docs.djangoproject.com/en/5.0/
3	https://www.w3schools.com/django/

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1												2	
CO2	2		2	1									2	
CO3	3		3	2	1								2	
CO4	2		3	2	1								1	
CO5	1		2	1					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, 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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(Government Aided Autonomous Institute)

AY 2024-25

Course Information					
Programme	B.Tech. (Computer Science Engineering)				
Class, Semester	Second Year B. Tech., Sem IV				
Course Code	7MDCS221				
Course Name	Data Structures and Algorithms				
Desired Requisites:	Programming				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/Week	**ISE**	**MSE**	**ESE**	**Total**
Practical	-	20	30	50	100
Interaction		**Credits: 3**			

Course Objectives	
1	To develop and improve logical thinking and to make the students capable of applying appropriate data structure for solving a given problem.
2	To explain and demonstrate different algorithm techniques for real world problem
3	To provide a foundation to analyse and compare various searching and sorting techniques and to select optimal techniques to solve the problem.

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 linear data structures and algorithm design, analysis techniques.	II	Understanding
CO2	apply knowledge of computing and mathematics, data structures to solve the problems.	III	Applying
CO3	analyze the various algorithm design techniques for a given problem.	IV	Analyzing
CO4	assess various data structure and algorithm.	V	Evaluating

Module Contents

I	**Introduction to Algorithms** Introduction, Evolution of Algorithms, Design of Algorithms, Need of correctness of Algorithms, Performance Analysis, Recurrence Equations: Solution of Recurrence Equations–Iteration Method and Recursion Tree Methods. Master's theorem, Towers of Hanoi.	6
II	**Linked Lists** Concept of linear data structure, Singly linked list, doubly linked list, circular linked list, Operations such as insertion, deletion, inversion,	6

	concatenation, computation of length, traversal on linked list, Representation of polynomials using linked lists.	
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, Priority queue, Doubly Ended Queue, Application of stack for expression evaluation and for expression conversion, Applications of Queue	7
IV	**Divide and Conquer Method** Binary Search, Merge Sort, Quick sort, Multiplication of Large Integers, Closest-Pair and Convex Hull Problems, Strassen's Matrix Multiplication.	7
V	**Greedy Method** Minimum Cost Spanning Trees, Job Sequencing with deadlines, Knapsack Problem, Optimal Merge Pattern, Huffman Trees.	7
VI	**Dynamic Programming Method** Principle of Optimality, Floyd's Algorithm, Multi Stage Graph, Optimal Binary Search Trees, 0/1 Knapsack problem.	6

Textbooks	
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, Sartaj Sahni and Rajasekaran "Fundamentals of Computer Algorithms" , Galgotia Publications, 2nd Edition.
References	
1	Goodman, "Introduction to Design and Analysis of Algorithm", McGraw Hill.
2	Jean-Paul Tremblay, Paul. G. Soresan, "An introduction to data structures with Applications", Tata Mc-Graw Hill International Editions, 2nd edition, 1984
3	Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein "Introduction to Algorithms" Third Edition, 2009,The MITPress Cambridge.
Useful Links	
1	http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
2	https://www.coursera.org/learn/data-structures
3	https://www.ebooks.com/en-in/book/1679384/algorithms-design-techniques-and-analysis/m-h-alsuwaiyel

CO-PO Mapping		
	Programme Outcomes (PO)	**PSO**

	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2												2	
CO2	2	3	2										2	
CO3	2	3	2										2	
CO4	2	2	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, and preferably to only 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

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7VSCS271
Course Name	Innovation and Design Thinking
Desired Requisites:	--

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 01			

Course Objectives	
1	To understand the fundamental concept of innovation and design thinking principles for product and service development.
2	To study the methods of implementing design thinking in the real world.
3	To develop the students as a good designer by imparting creativity and problem solving ability.
4	To propose a concrete, feasible, viable and relevant innovation project/challenge.

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 the critical theories of innovation & design, systems thinking, and design methodologies.	III	Demonstrating
CO2	apply the diverse methods employed in design thinking and establish a workable design thinking framework to use in their practices.	III	Applying
CO3	critically evaluate the applicability of different models of Design Thinking in business, technology, the environment, and society	IV	Evaluating
CO4	conceive, organize, lead and design the projects in interdisciplinary domain and address social concerns with innovative approaches	V	Designing

List of Experiments / Lab Activities/Topics

Whole course will be delivered as activity / project by team of 3 members (only one team of 4 members) in a practical batch. Each team will identify real world problem / challenge by carrying market survey (in first two weeks). Each team will provide innovative solution to identified problem using design thinking principles as follows :

Week	Activity
1	Introduction to Innovation life cycle
2	Introduction to Design Thinking - Rapid Design Challenge
3	Design Thinking Mindsets; Sustainable Development Goals Team Formation & Team Challenge : Finalizing problem statement
4	**Empathize**: Interviewing Techniques **Empathize**: How/Why Ladders
5	**Empathize**: Empathy Maps **Empathize**: What | How | Why
6	**Define**: Synthesize **Define**: Assumption Storming
7	**Define**: How Might We? **Define**: Customer Personas
8	Team Progress Updates / Review **Explore**: Brainstorming
9	**Explore**: How Might We? Revisited **Explore**: Synthesize and Prioritize
10	**Prototype**: Prototype with Purpose **Prototype**: Examples and Planning
11	**Test**: Prototype for Feedback **Test**: Learn from Feedback
12	**Iterative Design**: Embracing and Learning from Failure **Test & Deliver**: When and Why We Pitch
13	**Test & Deliver**: How to Pitch **Test & Deliver**: Pitch (presentation by each team)

During ESE, each team will submit the activity report.

Textbooks	
1	Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.

2	IdrisMootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc
3	Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve– Apply", Springer, 2011
References	
1	Ulrich &Eppinger, Product Design and Development, 3rd Edition, McGraw Hill, 2004
2	Human-Centered Design Toolkit: An Open-Source Toolkit To Inspire New Solutions in the Developing World by IDEO
3	Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).
Useful Links	
1	https://www.innovationmanagement.se/
2	http://designthinking.ideo.com/
3	https://www.interaction-design.ora/literature/topics/design-th/nking

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