D. Y. PATIL DEEMED TO BE UNIVERSITY
SCHOOL OF ENGINEERING AND MANAGEMENT
Teaching and Evaluation Scheme from Year 2024-25 (as per NEP-2020)
B. Tech. Computer Science Engineering (SEMESTER- III)

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical		Total Marks
				Credits	Contact Hrs			ISE	MSE	ESE	INT	OE/ PoE	
					L	P	T						
1	24CSEU3P01	PCC	Discrete Mathematical Structures	**3**	3	-	-	20	30	50	-	-	100
2	24CSEU3P02	PCC	Computer Networks	**3**	3	-	-	20	30	50	-	-	100
3	24CSEU3P03	PCC	Computer Networks Lab	**1**	-	2	-	-	-	-	25	25	50
4	24CSEU3P04	PCC	Data Structures & Algorithms	**3**	2	2	-	-	-	-	50	50	100
5	24CSEU3M06	MDM-I	Software Engineering	**2**	2	-	-	-	-	50	-	-	50
6	24CSEU3O09	OEC-I $	Fundamentals of Object Oriented Programming$	**3**	3	-	-	20	30	50	-	-	100
7	24CSEU3O10	OEC-I $	Fundamentals of Object Oriented Programming Lab $	**1**	-	2	-	-	-	-	25	-	25
8	24CSEU3F05	CEP/FP	Community Engagement Project	**2**	-	4	-	-	-	-	25	25	50
9	24CSEU3V08	VEC	Environmental Studies-I	**2**	2	-	-	-	-	50	-	-	50
10	24CSEU3H10	HSSM	Intellectual Property Rights	**2**	2	-	-	-	-	50	-	-	50
11	24CSEU3D11	AC	Finishing School Training - III	**-**	2*	-	-	-	-	-	50*	-	
12	24CSEU3C12	AC	Liberal Learning	**-**	2*	-	-	-	-	-	50*	-	
			Total	**22**	**17**	**10**	**0**						**675**

Note:
$ - Open & Distance Learning
* - Values are not included in total marks
Min. Marks for Passing: 40% of total marks of individual course

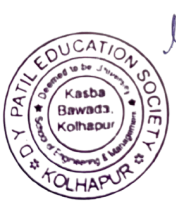
D. Y. PATIL DEEMED TO BE UNIVERSITY
SCHOOL OF ENGINEERING AND MANAGEMENT
Teaching and Evaluation Scheme from Year 2024-25 (as per NEP-2020)
B. Tech. Computer Science Engineering (SEMESTER- IV)

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical		Total Marks
				Credits	Contact Hrs			ISE	MSE	ESE	INT	OE/ PoE	
					L	P	T						
1	24CSEU4P01	PCC	Theory of Computation	**3**	3	-	-	20	30	50	-	-	100
2	24CSEU4P02	PCC	Operating Systems	**3**	3	-	-	20	30	50	-	-	100
	24CSEU4P03	PCC	Operating Systems Lab	**1**	-	2	-	-	-	-	25	25	50
3	24CSEU4P04	PCC	Object Oriented Programming	**3**	2	2	-	-	-	-	50	50	100
4	24CSEU4M05	MDM-II	Software Testing	**2**	2	-	-	--	-	50	-	-	50
5	24CSEU4O06	OEC-II	E-Commerce and Digital Marketing	**2**	2	-	-	-	-	50	-	-	50
6	24CSEU4A07	AEC	Trending Technology Laboratory	**2**	-	4	-	-	-	-	25	25	50
7	24CSEU4N08	VSEC	Web Technology-I	**2**	1	2	-	-	-	-	50	-	50
8	24CSEU4V09	VEC	Environmental Studies-II	**2**	2	-	-	-	-	50	-	-	50
9	24CSEU4H10	HSSM	Project Management Tools and Startup Ventures	**2**	1	2	-	-	-	-	50	-	50
10	24CSEU4D11	AC	Finishing School Training - IV	**-**	2*	-	-	-	-	-	50*	-	
11	24CSEU4C12	AC	Liberal Learning	**-**	2*	-	-	-	-	-	50*	-	
			Total	**22**	**16**	**12**	**0**						650

HONORS

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical		Total Marks
				Credits	L	P	T	ISE	MSE	ESE	INT	OE/ PoE	
1	24CSEU4Z01	Honors	Mathematical Foundations for AI/ML	3	3	-	-	20	30	50	-	-	100
2	24CSEU4Z01	Honors	Mathematical Foundations for AI/ML	1	-	2	-	-	-	-	25	-	25
3	24CSEU4Z03	Honors	Fundamentals of Cyber Security	3	3	-	-	20	30	50	-	-	100
4	24CSEU4Z04	Honors	Fundamentals of Cyber Security Lab	1	-	2	-	-	-	-	25	-	25

Note:
$ - Open & Distance Learning
* - Values are not included in total marks
Min. Marks for Passing: 40% of total marks of individual course



Semester III
Course Contents

Course Code:	24CSEU3P01		L	T	P	Credit
Course Name:	Discrete Mathematical Structures		3			3

Course Prerequsites:

1. Mathematics - Probability theory, Set theory, functions

Course Description:

This Course consists of concepts of Discrete mathematical structures such as mathematical logic, Sets, relations, functions, lattices and Boolean algebra, combinatorics and graph theory.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Explain the basic concepts of discrete mathematical structures
CO2	Demonstrate the applications of discrete structures in different fields of computer science.
CO3	Solve problems using the concepts of Discrete structures.
CO4	Apply the mathematical proofs and techniques to prove the theorems in computer science.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				1									
CO2	2			1	2	1						1	1	
CO3	2	2	2	1	1									
CO4	2	1	1	1	1	1								
CO5														

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

1

D Y PATIL EDUCATION SOCIETY KOLHAPUR Kasba Bawada, Kolhapur

Course Contents:		
Unit 1	**Mathematical logic**	**8 Hours**
1.1 Statements and Notations 1.2 Connectives , Statement formulas and truth tables, well formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives 1.3 Normal and principal normal forms, completely parenthesized infix and polish notations 1.4 Theory of Inference for statement calculus – validity using truth table, rules of inference, consistency of Premises and indirect method of proof, Predicate calculus		
Unit 2	**Set theory**	**8 Hours**
2.1 Basic concepts of set theory, Operations on sets, Ordered pairs, Cartesian Products 2.2 Representation of discrete structures 2.3 Relation and ordering - properties of binary relations in a set, Relation matrix and the graph of a relation, Partition and Covering of set, Equivalence relations, Recurrence relations, Composition of Binary relations,Partial ordering , POSET and Hasse diagram. 2.4 Functions – types, composition of functions, Inverse functions.		
Unit 3	**Algebraic systems**	**5 Hours**
3.1 Algebraic systems, properties and examples 3.2 Semigroups and Monoids, properties and examples, Homomorphism of Semigroups and Monoids 3.3 Groups: Definition and examples, Subgroups and homomorphism		
Unit 4		**5 Hours**
4.1 Lattice as POSETs , definition , examples and properties 4.2 Lattice as algebraic systems, Special lattices 4.3 Boolean algebra definition and examples 4.4 Boolean functions		
Unit 5	**Permutations, Combinations and Probability theory**	**7 Hours**
5.1 The Basics of Counting 5.2 The Pigeonhole Principle 5.3 Permutations and Combinations 5.4 Generalized Permutations and Combinations 5.5 Discrete Probability 5.6 Conditional probability 5.7 Bayes' Theorem		
Unit 6	**Graphs**	**7 Hours**
6.1 Introduction to Graphs 6.2 Graph Terminology 6.3 Representing Graphs and Graph Isomorphism 6.4 Connectivity 6.5 Euler and Hamilton Paths 6.6 Planar Graphs 6.7 Introduction to Trees		

Text Books:	
1. Discrete Mathematical Structures with Application to Computer Science - J. P. Tremblay & R. Manohar (MGH International) 2. Discrete Mathematics and its Applications - Kenneth H. Rosen (AT&T Bell Labs) (mhhe.com/rosen)	
Reference Books:	
1. Discrete Mathematics - SemyourLipschutz, MarcLipson (MGH), Schaum's outlines. 2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", SiE Edition, TataMcGrawHill, 2008,ISBN 10: 0-07-066913-9 3. Schaums Solved Problem Series – Lipschutz. 4. Discrete Mathematical Structures – Bernard Kolman, Robert Busby, S.C.Ross and NadeemurRehman (Pearson Education)	

3

Course Code:	24CSEU3P02
Course Name:	Computer Network

L	T	P	Credit
3			3

Course Prerequsites:

1. Basic knowledge of Communication Technology

Course Description:

This course provides a comprehensive introduction to the fundamental principles and technologies underlying computer networks, covering topics from physical layer communication to application-level protocols. Students will gain a deep understanding of network architectures, data transmission, routing algorithms, and essential network services like DNS, HTTP, and FTP.

Course Outcomes: After the completion of the course the student will be able to -

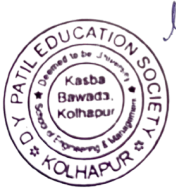
CO1	Describe the core concepts of data communication and the role of different layers in network communication.
CO2	Make use of framing, error control, flow control and medium access control techniques.
CO3	Explain IP addresses, IP protocols, types of routing algorithm and congestion control techniques.
CO4	Illustrate process to process communication, multiplexing and transport layer protocols.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2								1		2	1	
CO2	2	2			2				1	2				
CO3	1	1	2	1	3							1		2
CO4	2	2		1	1								1	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents



Course Contents:

Unit 1	**Introduction to Network**	**5 Hours**
Data Communication, , Networks, Internet, Protocols and Standards, Layered Task, OSI Model and Layers, TCP/IP Protocol Suite, Addressing, Physical Layer and Media		
Unit 2	**Data Link Control Layer**	**9 Hours**
Error Detection and Correction, Block Coding, Linear Block Codes, Cyclic Codes, Checksum, Data Link Control: Framing, Flow and Error Control, Protocols: Noiseless channels, Noisy Channels		
Unit 3	**Medium Access Control Sub layer**	**7 Hours**
Channel allocation Problem, Multiple Access Protocols: ALHOA, CSMA, Collision free protocols, Limited contention protocols IEEE Standard 802 for LANS and MANS, Bridges, Introduction to VLANS		
Unit 4	**Network Layer**	**8 Hours**
Network Layer Design Issues Routing Algorithms : Shortest Path, Flooding, Distance Vector, Link State, Broadcast IP,ARP,RARP,ICMP. Congestion control algorithms: Principles, Congestion prevention policies, Traffic Shaping, congestion control in datagram subnet, Choke Packet, Load Shedding, Jitter Control, IPv4 Addresses : Introduction, Classfull and Classless addressing, Special Addresses and NAT.		
Unit 5	**Transport Layer**	**4 Hours**
Transport Layer functions, UDP- datagram, services, applications, TCP - services, segment, connection, state transition diagram, Flow control, congestion control, error control, timers.		
Unit 6	**Application Layer**	**9 Hours**
DHCP: Introduction, DHCP operation, Packet Format, DHCP Configuration, DNS: Need, Name Space, Domain Name Space, Distribution of name space, and DNS in internet, Resolution, DNS massages, Types of records, Compression examples, encapsulation. Telnet and SSH, FTP and TFTP, HTTP and SMTP, SNMP: Concept and Management Component,SMI,MIB,SNMP, UDP Port and Security		

Text Books:

1. Data Communications and Networking – Behrouz A Forouzan (The McGraw Hill) (Unit 1,2,3)
2. Computer Networks – Andrew S. Tanenbaum- (Prentice Hall) 5th Edition (Unit 3, 4)
3. TCP/IP Protocol Suite- Behrouz Forouzan-(The McGraw Hill) (4,5,6)

Reference Books:

1. Computer Networking with Internet Protocols and Technology, William Stallings (Prentice Hall)

D.Y. PATIL EDUCATION SOCIETY KOLHAPUR Kasba Bawada, Kolhapur

Course Code:	24CSEU3P03
Course Name:	Computer Network Lab

L	T	P	Credit
		2	1

Course Prerequsites:

1. Basic knowledge of Computers and LINUX/UNIX-based operating system

Course Description:

This course provides a solid understanding of implementation of different framing, error control, flow control and routing algorithms.
Help students to design network as per the requirement. Students can develop client server application using socket API and make them understand different application layer protocol with help of simulation and demonstration.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Build sample network and VLAN as per the organization requirements.
CO2	Develop software programs for framing, error control, flow control and routing algorithms.
CO3	Make use of socket API to develop client-server programs.
CO4	Inspect working of different types of application layer protocols from TCP/IP protocol suite.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2								1		2	1	
CO2	2	2			2				1	2				
CO3	1	1	2	1	3							1		2
CO4	2	2		1	1								1	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	50%	Experiment, Practical Performance and Oral Exam etc.
2	Practical Oral Exam (ESE)	50%	Practical Performance and Oral Exam

Course Contents:

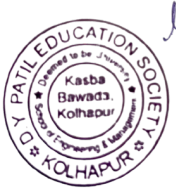
Experiment 1: Demonstration of networking commands	2 Hours
Experiment 2: Design and simulation of sample network	2 Hours
Experiment 3: Implementation of framing techniques A) Character count B) Bit stuffing	2 Hours
Experiment 4: Implementation of Error control mechanisms A) CRC B) Hamming Code	2 Hours
Experiment 5: Implementation of Flow control mechanisms A) Stop and wait ARQ B) Go Back N C) Selective repeat	2 Hours
Experiment 6: Design and simulate working of Virtual LAN	2 Hours
Experiment 7: Implementation of Routing algorithm A) Shortest path routing B) Distance vector routing	2 Hours
Experiment 8: Implementation of Client-Server model A) Simple client-server model B) Iterative client-server model C) Concurrent client-server model	2 Hours
Experiment 9: Simulation of application layer protocol	2 Hours
Experiment 10: Installation and Configuration of FOSS server	2 Hours

Text Books:

1. Data Communications and Networking – Behrouz A Forouzan (The McGraw Hill) (Unit 1,2,3)
2. Computer Networks – Andrew S. Tanenbaum- (Prentice Hall) 5th Edition (Unit 3, 4)
3. TCP/IP Protocol Suite- Behrouz Forouzan-(The McGraw Hill) (4,5,6)

Reference Books:

1. Computer Networking with Internet Protocols and Technology, William Stallings (Prentice Hall)



Course Code:	24CSE3UP04
Course Name:	Data Structures and Algorithms

L	T	P	Credit
2		2	3

Course Prerequsites:

1. Basic Knowledge of C, and Linear Data Structures
2. Basic mathematical Approach

Course Description:

The course is designed to develop skills to design and analyze non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures

Course Outcomes: After the completion of the course the student will be able to -

CO1	Implement and apply various types of linked lists (singly, doubly, circular) for solving linear data structure problems.
CO2	Implement various tree and graph data structures
CO3	Analyze and implement various hashing techniques for efficient data retrieval.
CO4	Design solutions using appropriate non-linear data structures to solve complex computational problems.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1													
CO2	2	3	2	2	2				1					1
CO3	1	1	2	2	2				1					1
CO4	1	3	1	2	1				1					3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (ISE)	50%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	End Semester Examination (ESE)	50%	Practical Oral Exam

Course Contents:

Unit 1	**Linked Lists**	**7 Hours**
Introduction to Linked Lists Singly Linked List: Operations (Insert, Delete, Search, Traverse) Doubly Linked List: Operations and Applications Circular Linked List: Operations and Applications		
Unit 2	**Trees**	**8 Hours**
Basic Concepts: Terminology, Types of Trees Binary Tree: Representation and Traversals (Inorder, Preorder, Postorder) Binary Search Tree: Operations and Implementation AVL Trees: Rotations and Balancing Heap Trees Applications		
Unit 3	**Graphs**	**8 Hours**
Graph Terminology and Representation (Adjacency Matrix/List) Graph Traversals: BFS and DFS Minimum Spanning Tree: Kruskal's and Prim's Algorithm Shortest Path Algorithms: Dijkstra's and Floyd-Warshall		
Unit 4	**Hashing**	**4 Hours**
Hashing, Hash Tables and Hash Functions Collision Resolution Techniques: Chaining, Linear Probing, Quadratic Probing, Double Hashing		

Text Books:

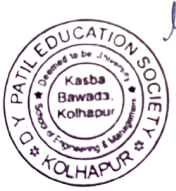
1. Schaum's Outlines Data Structures – Seymour Lipschutz (MGH)
2. Data Structures- A Pseudo code Approach with C – Richard F. Gilberg and Behrouz A. Forouzon 2nd Edition

Reference Books:

1. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein (PHI)
2. Fundamentals of Data Structures - Horowitz, Sahani (CBS India)

List of Experiments:

1. Implement Searching Techniques (Linear and Binary)
2. Implement Sorting Techniques (Bubble, Selection and Insertion)
3. Implement stack and Queue using array
4. Write a C program to implement operations on Singly Linked list
5. Write a C program to implement operations on Stack using Linked List
6. Write a C program to implement operations on Linear Queue using Linked List
7. Write a C program to implement operations on Doubly Linked list
8. Write a C program to implement operations on Circular Queue using Linked List
9. Write a C program to implement BST and its traversal
10. Write a C program to implement BFS
11. Write a C program to implement DFS
12. Write a C program to implement Different Hashing methods and collision resolution methods



Course Code:	24CSEU3F05
Course Name:	Community Engagement Project

L	T	P	Credit
		4	2

Course Prerequsites:

1. Basic Knowledge of Computer programming

Course Description:

This course aims to engage students in understanding the issues faced by rural areas in India and equipping them with the knowledge of computer science and e-services provided by the Government of India to address these issues. Through group projects, presentations, and practical demonstrations, students will develop a deeper understanding of community service and the use of technology in addressing societal challenges.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Identify the real life problem in rural areas of India
CO2	Work effectively in groups while collecting data, preparing presentations and videos on the identified project
CO3	Apply classroom knowledge to identify and solve the problems of people in nearby community.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1								3					
CO2	1	2	2		2	1			3	3			2	1
CO3	1	1	2		2			2	3		2		2	1

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (INT)	50%	Demo, Seminar, Presentation, etc.
2	End Semester Examination (ESE)	50%	Practical Oral Exam

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Course Contents:	
Unit 1	**Introduction to Community engagement projects and common people issues.**
Introduction to Community engagement projects and common people issues. Identify common problems in rural areas Case studies and discussions on successful community service initiatives.	
Unit 2	**Introduction to HTML**
What is HTML?, Features of HTML, HTML Elements and Tags, HTML Page Structure, Web Browsers, Why learn HTML?, Advantages and Disadvantages of HTML, HTML Editors (Notepad, Brackets, Sublime Text Editor, Atom, Visual Studio Code), HTML Basics, HTML Elements, Attributes, Heading, Paragraph, Text Formatting, colors, Hyperlink, Image, Tables, List, div, class, id, HTML Favicon, Iframes, Layout, HTML events, HTML 5, HTML form, HTML API (Geolocation API)	
Unit 3	**Introduction to CSS**
CSS Fundamentals: CSS Syntax, Ruleset, Selectors, Combinators, Box model, Layout, lists, table, image gallery, CSS Styling: Fonts, colors, Background, borders, Grid, images, list, counters, columns, conditional rules, logical properties, CSS Responsive Design	
Unit 4	**Introduction to Bootstrap 5**
Introduction, Layout, Content, Forms, Forms Layout, Components, Helpers, Utilities Introduction to Joomla & Wordpress CMS, Web Hosting Basics	
Unit 5	**Guidelines**
The Project should be undertaken preferably by a group of 3-4 students who will jointly work and implement the project. The group will select a project with the approval from the domain expert panel and submit the name of the project with a synopsis. The Project should consist of defining the problem and analyzing it, designing the solution and implementing it using a suitable programming language. A presentation and demonstration based on the above work is to be given by the group for ISE. The work will be jointly assessed twice in a semester by an internal domain expert panel. A hard copy of project report of the work done is to be submitted along with the softcopy of the project during ESE.	
Assessment: Participation in group activities: 20% Group project development and presentations: 40% Project demonstration: 10% Final reflection of the work: 30% **Note: Two practical sessions of 2 hours per week will be dedicated to project development, research, and hands-on training**	
Text Books:	
1. HTML & CSS: The Complete Reference, Fifth Edition by ThomasPowell 2. Pro HTML5 and CSS3 Design Patterns by Michael Bowers, Dionysios Synodinos and Victor Sumner, Apress edition 3. Bootstrap 5 Foundations by Daniel Charles Foreman, Daniel Foreman 4. Mastering Bootstrap 5: From Basics to Expert Projects Kindle Edition	
Reference Books:	
1. Responsive Web Design with HTML5 and CSS3 by Ben Frain, Packt Publication 2. Twitter Bootstrap Development How to by David Cochran, Packt Publication	

Course Code:	24CSEU3M06		L	T	P	Credit
Course Name:	Software Engineering		2			2

Course Prerequsites:

Problem Solving Using C

Course Description:

This course gives you fundamentals of software development in the current IT industry. The fundamentals are divided into different parts. The first part deals with different software models followed for development of software. The subsequent parts deals with requirement specification, software design with UML, coding and testing respectively. You will get complete insight of software development process which will help you a lot in your career in IT industry

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Summarize the basic processes of software development and various SDLC models.
CO2	Analyze software requirements analysis and formulate design solution for a software.
CO3	Apply new software design techniques and technologies to bring out innovative solutions for the socital problems evolving into their continuous professional development.
CO4	Use knowledge of software testing approaches for verification and validation.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1										2			
CO2		1	2		1				3	3	1		1	2
CO3		1	1		2			1	3	3	2	3	3	2
CO4	1	1	1		2			1	3	2		3	3	1

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	End Semester Examination (ESE) (50 Marks)	100%	100% course contents

Course Contents:		
Unit 1	**Software and Software Process**	**5 Hours**
The Problem Domain, SE Challenges, SE Approaches, Software Process, Desired Characteristics of a Software Process, Software Development Process Models- Waterfall Model, Prototype Methodology, Agile Software Development Methodology, Rapid Application Development (RAD),Dynamic Systems Development Model Methodology, Spiral Model, Extreme Programming Methodology, Feature Driven Development.		
Unit 2	**Software Requirement Analysis and Specifications**	**4 Hours**
Software Requirements, Problem Analysis, Requirements Specification, Functional Specifications with use cases, Validation, Metrics		
Unit 3	**Software Design Approaches**	**6 Hours**
Design Principles, Module-Level Concepts, Design Notation and Specification, Structured Design Methodology, OO Analysis and OO Design, OO Concepts, Design Concepts		
Unit 4	**UML Structural Modeling**	**4 Hours**
Classes,Relationship,Common Mechanics, Diagrams and Class Diagrams,Advanced Classes, Advanced Relationships, Interfaces, Types, and Roles, Packages, Instances and Object Diagram		
Unit 5	**UML Behavioral and Architectural Modeling**	**5 Hours**
Behavioral: Interactions, Use Cases, Use Case Diagrams, Interaction Diagrams, Activity Diagrams Architectural: Components, Deployment, Collaborations, Patterns and Frameworks, Component Diagrams, Deployment Diagrams		
Unit 6	**Coding and Testing**	**4 Hours**
Programming Principles and Guidelines, Coding Process, Refactoring, Verification, Metrics, Testing Fundamentals, Black-Box Testing, White-Box Testing.		
Text Books:		
1. An Integrated approach to Software Engineering' –Pankaj Jalote, 3rd Edition, Narosa Publication. (1,2,3,6) 2. UML User Guide- Grady Booch, James Rumbaugh, Publisher: Addison Wesley (4,5)		
Reference Books:		
1. Software Engineering- A Practitioner's Approach – Roger S. Pressman (TMH) , ISBN-13: 978-0071267823 ISBN-10:0071267824 2. Software Engineering- Ian Sommerville – Pearson, 10th Edition, ISBN-13: 9780137503148 3. Software Engineering, Kogent Learning Solutions Inc., Dreamtech Press India Pvt. Ltd, ISBN: 9789350042663, 9789350042663		

Course Code:	23CSEU3V08
Course Name:	Environmental Studies - I

L	T	P	Credit
2			2

Course Prerequsites:

1. Understanding of Environmental Education course

Course Description:

The main objective of course is to create awareness among students regarding environmental issues and its impact on society. Knowledge regarding environmental components, its degradation and protection of environment is need for sustainable future ahead.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Understand the scope and importance of Environmental awareness and Sustainable development
CO2	Understand various Environmental issues due to development.
CO3	Understand various modes of Environmental management through techno and legislation
CO4	Acquire problem solving attitude through actual field experience and report it in the form of a field report.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1						2							
CO2							2							
CO3							2							
CO4							2							

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (ISE)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
	Mid Semester Exam	30%	50%ofcourse contents
	In Semester Evaluation (ISE)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	End Semester Examination (ESE)	50%	100%course contents

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Course Contents:

Unit 1	**Our Environment**	**5 Hours**
Introduction to Environment, Scope of Environmental Studies, Importance of Environmental Awareness, Concept of Sustainability, Sustainable development : History and Goals, Environmental Ethics and Sustainability Ethics, Population Growth and its Impact on Environmental Health		
Unit 2	**Development and Environmental Health**	**8 Hours**
Natural resources: Natural Resources: Types (Renewable and Non-renewable), Developmental Benefits, Forest: Benefits and Problems (Deforestation), Biodiversity: Importance, Threats, Conservation, Ecosystems: Importance, Problems, Ecological Restoration, Air: Benefits and Problems (Pollution, Climate Change), Water: Benefits and Problems (Depletion, Pollution), Soil/Land: Benefits and Problems (Degradation, Fertility Loss, Desertification), Minerals: Benefits and Problems (Mining, Overexploitation, Pollution), Energy Resources: Benefits and Problems (Depletion, Energy Crisis), Urbanization and Environmental Health, Urban Problems and Solid Waste: MSW Effects, Plastic, Hazardous Waste, E-Waste		
Unit 3	**Environmental Management**	**8 Hours**
Renewable Energy Technologies (Biogas, Biofuel, Hydrogen, etc.), Pollution Abatement: 5R, ZLD, Carbon Credit, Bio Remedies, Soil/Land Reclamation and Sustainable Agriculture, Environmental Impact Assessment (EIA), Environmental Audit, ISO 14001 Certification, Role of CPCB and MPCB in Environmental Protection, Emerging Environmental Technologies: GIS, Remote Sensing, IoT, Smart Bins, Waste-to-Energy, Recycling Automation, Circular Economy Practices, Sustainable Packaging, Community Engagement, Decentralized Waste Treatment, Zero-Waste Initiatives, Environmental Legislation: Environmental Protection Act, Air Act, Water Act, Solid Waste Management Act, Hazardous Waste Management Rules, E-Waste (Management) Rules, 2022.		
Unit 4	**Field Project Work**	**5 Hours**
Case studies based on field visit (Each student must complete a project on an environmental issue and propose solutions)		

Text Books:

1. Erach Bharucha – Textbook of Environmental Studies for Undergraduate Courses
   Publisher: University Grants Commission / Orient Blackswan
   ISBN: 9788173715402
2. Benny Joseph – Environmental Science and Engineering
   Publisher: McGraw Hill Education
   ISBN: 9789339221266
3. Anubha Kaushik & C.P. Kaushik – Perspectives in Environmental Studies
   Publisher: New Age International Publishers
   ISBN: 9788122439802

Reference Books:

4. Rajagopalan – Environmental Studies: From Crisis to Cure
Publisher: Oxford University Press
ISBN: 9780198067691
5. S.K. Dhameja – Environmental Studies
Publisher: S.K. Kataria & Sons
ISBN: 9789350141014
6. A.K. De – Environmental Chemistry
Publisher: New Age International Publishers
ISBN: 9788122419460
7. P.D. Sharma – Ecology and Environment
Publisher: Rastogi Publications
ISBN: 9788171337033
8. S.C. Santra – Environmental Science
Publisher: New Central Book Agency
ISBN: 9788173810732
9. N. Basak – Environmental Engineering
Publisher: McGraw Hill Education
ISBN: 9789339205181
10. Ministry of Environment, Forest and Climate Change (MoEFCC) – Reports and Surveys
(Available at: https://moef.gov.in)

Semester IV
Course Contents

Course Code:	24CSEU4P01
Course Name:	Theory of Computation

L	T	P	Credit
3			3

Course Prerequsites:

1. Discrete Mathematics, Sets, Cartesian Product and Functions

Course Description:

This course deals with the theoretical background of computer science.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Explain the fundamental concepts of formal languages, grammars, and automata.
CO2	Classify formal languages on the basis of their features.
CO3	Relate the computational models with the modern day computer technologies.
CO4	Design computational machines of various types for specified problems.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1			1									
CO2	2	2		1	3									
CO3	2	2	2	2	2									2
CO4	2	1	2	1	1	1								3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

Unit 1	**Mathematical Induction, Regular Languages & Finite Automata**	**8 Hours**
The Principle of Mathematical Induction Recursive Definitions, Definition & types of grammars & languages, Regular expressions and corresponding regular languages, examples and applications, unions, intersection & complements of regular languages, Finite automata-definition and representation, on-deterministic F.A.,NFA with null transitions, Equivalence of FA's , NFA's and NFA's with null transitions.		
Unit 2	**Kleene's Theorem**	**4 Hours**
Part I & II statements and proofs, minimum state of FA for a regular language, minimizing number of states in Finite Automata.		
Unit 3	**Grammars and Languages**	**10 Hours**
Derivation and ambiguity, BNF & CNF notations, Union, Concatenation and *'s of CFLs, Eliminating production & unit productions from CFG, Eliminating useless variables from a context Free Grammar. Parsing: Top-Down, Recursive Descent and Bottom-Up Parsing.		
Unit 4	**Push Down Automata**	**4 Hours**
Definition, Deterministic PDA & types of acceptance, Equivalence of CFG's & PDA's.		
Unit 5	**CFL's and non CFL's**	**4 Hours**
Pumping Lemma and examples, intersections and complements		
Unit 6	**Turing Machines**	**10 Hours**
Models of computation, definition of Turing Machine as Language acceptors, combining Turing Machines, Computing a function with a TM, Non-deterministic TM and Universal TM, Recursively enumerable languages,Unsolvable problems.		

Text Books:

1.Introduction to languages & Theory of computations – John C. Martin (MGH)
2.Discrete Mathematical Structures with applications to Computer Science—J .P.Trembley &R.Manohar

Reference Books:

1.Introduction to Automata Theory , Languages and computation – John E. Hopcraft , Rajeev Motwani, Jeffrey D. Ullman (Pearson Edition)
2.Introduction to Theory of Computations – Michael Sipser (Thomson Brooks / Cole)
3.Theory Of Computation- Vivek Kulkarni, 1st edition OXFORD university Press
4.Theory Of Computation A problem Solving Approach Kavi Mahesh Wiley India

Course Code:	24CSEU4P02
Course Name:	Operating Systems

L	T	P	Credit
3			3

Course Prerequsites:

Fundamentals of Electronics and Computer

Course Description:

This is one of the core course of Computer Science & Engineering Programme. In this course you will become familiar with the core concepts of OS - how OS work, how a **processes & threads** are created, **inter-process communication & synchronisation**, the various **scheduling** algorithms, **memory management** & memory allocation strategies, etc. This course will be also helpful for exams like GATE.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Describe the basic concepts of operating systems.
CO2	Evaluate the performance of various scheduling & page replacement algorithms.
CO3	Distinguish techniques of inter process communication and synchronization.
CO4	Identify potential deadlock situations and propose appropriate strategies to handle or avoid deadlocks.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2									1	2	1	
CO2	2	2			2					1	2			
CO3	1	1	2	1	3							1		2
CO4	2	2		1	1								1	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:		
Unit 1	**Introduction**	**6 Hours**
Introduction to OS, OS Structure, Types of OS, OS Kernel, OS Services, Users Prespective of OS, System Boot Process, Architecture of UNIX OS		
Unit 2	**Process, Threads & Scheduling**	**8 Hours**
Process: Concept, States and Transitions, Context, Creation (fork), Termination (exit), Signals (signal, kill), Awaiting Process Termination(wait, waitpid), Invoking other programs (exec), Threads (pthreads) Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.		
Unit 3	**Interprocess Communication**	**6 Hours**
Inter-Process Communication - Pipe, Shared Memory, Message Passing		
Unit 4	**Process Synchronization**	**7 Hours**
Inter-Process Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization		
Unit 5	**Deadlocks**	**6 Hours**
Deadlock: System Model; Deadlock Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from Deadlock		
Unit 6	**Memory Management**	**8 Hours**
Memory background, Hierarchy, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.		

Text Books:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Principles, 8th edition, Wiley India, 2009. 2. Operating Systems –Concepts and design –Milan Milenkovic (TMGH)

Reference Books:
1. The Design of Unix Operating System - Maurice J. Bach (PHI) 2. Operating Systems: Internals and Design Principles (8th Edition)- by William Stallings (Pearson Education) 3. Modern Operating Systems by Andrew S. Tanenbaum (Pearson Education International) 4. Unix concepts and administration – 3rd Edition – Sumitabha Das (TMGH).

Course Code:	24CSEU4P03
Course Name:	Operating Systems Lab

L	T	P	Credit
		2	1

Course Prerequsites:

1. Knowledge of any programming language like (C, C++, Python, Java)

Course Description:

This is one of the core course of Computer Science & Engineering Programme. In this course you will become familiar with the core concepts of OS - how OS work, how a processes & threads are created, inter-process communication & synchronisation, the various scheduling algorithms, memory management & memory allocation strategies, etc. This course will be also helpful for exams like GATE.

Course Outcomes: After the completion of the course the student will be able to -

CO1	develop multiprocess/multithreaded applications.
CO2	implement various IPC mechanisms such as pipes, message queues, shared memory.
CO3	solve the sychronization problems for process/thread coordination.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		1		3				1		1	1	1	2
CO2	3	1	2		3				1		1	1	2	2
CO3	3	1	2		3				1		1	1	3	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (ISE)	50%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	End Semester Examination (ESE)	50%	Practical Oral Exam

List of Experiments:

1	Study of basic linux commands used for process management
2	Multiprocessing with fork() and exec() system calls
3	Command line arguments in C language
4	Multithreading with POSIX Threads.
5	Scheduling Algorithms
6	Interprocess Communication with PIPE
7	Interprocess Communication with MESSAGES QUEUE
8	Interprocess Synchronization with SEMAPHORES
9	Bankers Algorithm
10	Page Replacement Algorithm

Course Code:	24CSEU4P04
Course Name:	Object Oriented Programming

L	T	P	Credit
2	0	2	3

Course Prerequsites:

1. Procedural Programming Language

Course Description:

This course introduces students to the principles of object-oriented programming using Java. Students will develop practical skills through hands-on coding exercises and projects, learning to design and implement efficient, reusable, and maintainable code using OOP concepts.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Understand the fundamentals of Object-Oriented Programming (OOP) and Java language constructs.
CO2	Apply various object-oriented features to solve real-life problems using Java Programming language.
CO3	Make use of file I/O operations and exceptions in Java to create robust and error-resilient programs.
CO4	Utilize appropriate collection classes to solve real-world programming problems.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1								1	1		3	1	
CO2	1	1	2		3			2	1	2			3	2
CO3	1	1	2		3			2	1	1		3	3	2
CO4					3				1				2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	Internal Assessment	50%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	POE	50%	Practical/Oral Examination

Course Contents:		
Unit 1	**Introduction to OOPs concepts and Java Programming**	**3 Hours**
Introduction to procedural & object-oriented programming, Limitations of procedural programming, Need of object-oriented programming, **Fundamentals of object-oriented programming:** objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism. **Introduction to Java Programming:** The Java Buzzwords, The Java Programming Environment- JVM, JIT Compiler, Byte Code Concept, A Simple Java Program, Source File Declaration Rules, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, ArraysJagged Array.		
Unit 2	**Classes and Objects**	**5 Hours**
Object-Oriented Programming Concepts, Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Passing Information to a Method or a Constructor, Creating and using objects, Controlling Access to Class Members(Access specifiers – public, private, protected,), Static Fields and Methods, this keyword, Object Cloning, use of the new keyword, Method overloading, array of objects, passing objects to functions, returning object.		
Unit 4	**Inheritance, Interface and Packaging**	**6 Hours**
Inheritance: Definition, Superclasses, and Subclasses, Overriding and Hiding Methods, Polymorphism, Inheritance Hierarchies, Super keyword, Final Classes and Methods, Abstract Classes and Methods, casting, Design Hints for Inheritance, Nested classes & Inner Classes. **Interfaces:** Defining an Interface, Implementing an Interface, Using an Interface as a Type, Evolving Interfaces, Default Methods. **Packages:** Class importing, Creating a Package, Naming a Package, Using Package Members, Managing Source and Class Files		
Unit 5	**Exception Handling and File I/O**	**6 Hours**
I/O Streams: Byte Stream – InputStream, OutputStream, DataInputStream, DataOutputStream, FileInputStream, FileOutputStream, Character Streams, BufferedStream, Scanner, File, RandomAccesFile. **Exception:** Definition, Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions, Catching Multiple Exceptions, Re-throwing and Chaining Exceptions, finally clause, Advantages of Exceptions, Tips for Using Exceptions.		
Unit 5	**Multithreading and Collections**	**6 Hours**
Multithreading: Processes and Threads, Runnable Interface and Thread Class , Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Thread States, Thread Properties, Joins, Synchronization **Collections:** Collection Interfaces, Concrete Collections- List, Queue, Set, Map, the Collections Framework.		

Text Books:
1. "Core Java Volume I – Fundamentals" by Cay S. Horstmann and Gary Cornell 2. "Java: The Complete Reference" by Herbert Schildt

Reference Books:
1. "Head First Java" by Kathy Sierra and Bert Bates

List of Experiments:

1. Write a Java program to implement data types, operators
2. Write a Java program to implement simple class and objects
3. Write a Java program to implement Contructor overloading
4. Write a Java program to implement Method overloading
5. Write a Java program to implement different types of inheritance
6. Write a Java program to implement abstract class
7. Write a Java program to implement interface
8. Write a Java program to implement package
9. Write a Java program to implement File Handling
10. Write a Java program to implement Exception Handling
11. Write a Java program to implement Multithreading
12. Write a Java program to implement different collection

Course Code:	24CSEU4M05		L	T	P	Credit
Course Name:	Software Tesing		2			2

Course Prerequsites:

1. Programing for problem solving
2. Software Engineering

Course Description:

The subject of software testing encompasses the principles, methods, techniques, and practices used to evaluate and validate software applications and systems. It involves ensuring that software functions correctly, meets requirements, and performs reliably under various conditions before it is released to users.

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Describe importance of software testing.
CO2	Understand the software testing process and various types of testing.
CO3	Construct various technical documents for Testing.
CO4	Make use of Automation Tools for testing various types of S/W applications.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1											1			1
CO2				1	1				3	1		1	1	
CO3			2	2	2				3	2		1	3	1
CO4			2		2					2		3	3	1

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	End Semester Examination (ESE)	100%	100% course contents

Course Contents:

Unit 1	**Introduction to Software Testing**	**6 Hours**
Software Error Case Studies,What Is a Bug?,Cost of Bugs, Role of Software Tester, Software Development Process , Product Components, Software Project Staff, Software Development Lifecycle Models,Big-Bang, Code and fix, Waterfall Model, Spiral Model, tesing Axioms, Software Testing Terms and Definitions.		
Unit 2	**Testing Fundamentals**	**4 Hours**
Examining the Specification, Dynamic Black-Box Testing, Test-to-Pass and Test-to-Fail, Equivalence Partitioning, Data Testing, State Testing, Other Black-Box Test Techniques.		
Unit 3	**Static and Dynamic Testing**	**5 Hours**
Static White-Box Testing, Coding Standards and Guidelines, Generic Code Review Checklist, Dynamic White-Box Testing, Testing the Pieces, Data Coverage, Code Coverage.		
Unit 4	**Usability Testing & Web Site Testing**	**4 Hours**
Usability Testing: User Interface Testing , Standards or Guidelines for Good GUI, Accessibility Testing **Web Site Testing**: Web Page Fundamentals, Black-Box Testing, Gray-Box Testing, White-Box Testing, Introducing Automation.		
Unit 5	**Testing the Documentation**	**4 Hours**
Types of Software Documentation, The Importance of Documentation, What to Look for in reviews, The Realities of Documentation.		
Unit 6	**Automated Testing and Test Tools**	**5 Hours**
The Benefits of Automation and Tools, Test Tools, Software Test Automation, Open Source Tools: Selenium, Apache Jmeter.		

Text Books:

1. Software Testing, Ron Patton, by Sams Publishing
2. Software Testing: Principles and Practices, Srinivasan Desika Gopalswamy ramesh, Pearson Publisher:Pearson India 2005, ISBN:9788177581218.
3. http://www.selenium.com.
4. https://jmeter.apache.org

Reference Books:

1. Software Testing, Yogesh Singh, Cambridge University Press, Bangluru,ISBN 978-1-107-65278-1
2. Software Testing: Pronciples, Techniques and Tools, limaye M.G. Tata McGrawHill Education, New Delhi. 2007, ISBN-9780070139909

Course Code:	24CSEU4O06		L	T	P	Credit
Course Name:	E-Commerce and Digital Marketing		2			2

Course Prerequsites:

Knowledge of Social Media channels

Course Description:

This course consists of introductory knowledge of E-commerce, all fundamental terminologies and basic concepts. Also it consists of basic knowledge of digital marketing further it describes online marketplace analysis & macro environment. Digital Marketing Strategy and relationship marketing is also learnt. Finally this describes Electronic Payment System

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Identify the importance of the e-commerce and digital marketing for successful business.
CO2	Create a digital marketing plan with SWOT analysis and a target group.
CO3	Identify digital channels and business tools used in social networking .
CO4	Demonstrate the optimization of web site using business tools.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2										1			
CO2		2	2											2
CO3			1		2									1
CO4	1	1	1									1		2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	End Semester Examination (ESE)	100%	100% course contents

Course Contents:		
Unit 1	**Introduction to E-commerce, frameworks & architectures**	**6 Hours**
Introduction, the term E-Commerce, Business models related to E-Commerce, Technical and economical challenges, Frameworks and architectures, Actors and stakeholders, Fundamental sales process, Technological elements. Business to Business, Business to customers, Customers to Customers, Business to Government, Business to Employee, E – Commerce strategy, Influencing factors of successful E– Commerce, Digital Signatures.		
Unit 2	**Introduction to Digital Marketing - Strategy and relationship marketing**	**8 Hours**
How digital technologies transformed marketing?, Definitions- digital marketing and multichannel marketing- Paid, owned and earned media, the growing range of digital marketing platform, digital marketing strategy-key features of digital marketing strategy, applications of digital marketing, benefits of digital marketing, alternative digital business models, difference between e-commerce and e-business, challenges in developing and managing digital marketing strategy, Digital Marketing strategy development, how to structure digital marketing strategy, strategy implementation, relationship marketing using digital platforms, the challenge of customer engagement, customer lifecycle management, Marketing Communications using digital media channels: Introduction, search engine marketing		
Unit 3	**Online marketplace analysis & macro environment**	**6 Hours**
Introduction, situation analysis for digital marketing, the digital marketing environment, understanding customer journeys, online consumer behaviour and implications for marketing, business models for e-commerce, Online macro environment, technological forces, economic forces, political forces, Legal forces, social forces and cultural forces		
Unit 4	**Electronic Payment System**	**6 Hours**
Introduction , Online payment Systems, prepaid and post paid payment systems, e– cash, e– cheque, Smart Card, Credit Card , Debit Card, Electronic purse , Security issues on electronic payment system, Solutions to security issues, Biometrics and types of biometrics, Legal and ethical issues in E– Commerce, Security issues in E–Commerce, Regulatory framework of E– commerce.		

Text Books:
1.Martin Kutz. & bookboon.com, “Introduction to E-commerce: Combining Business & Information Technology” 1 st Edition, (2016), (Unit 1). 2. Dave Chaffey, Fiona Ellis-Chadwik , “Digital Marketing: Strategy, Implementation and Practice”, Pearson Education , 6 th Edition (Unit 2,3,4).

Reference Books:
1.Pulizzi, J, “The Beginner's Guide to Digital Marketing “, Epic Content Marketing, McGraw Hill Education, (2015). 2.Jeffrey F Rayport and Bharat Bhasker, “Electronic Commerce”, Tata McGraw Hill. 3.Turban, Efraim, and David King, “Electronic Commerce: A Managerial Perspective”, 2010, Pearson Education Asia, Delhi. 4. Romuald Andrade, “Beginners Guide To Digital Marketing: How To Flood Your Website With Traffic In 30 Days” ,(2015).

Course Code:	24CSEU4A07	L	T	P	Credit
Course Name:	Trending Technology Laboratory			4	2

Course Prerequsites:

Mathematics, Data Structures, Software Engineering and knowledge of Programming language.

Course Description:

This course emphasis on a problem-based learning approach. It is a group activity where students have to present an idea/solution for the problem chosen. The Trending Technology Lab provides hands-on experience with emerging technologies such as the Internet of Things (IoT) and Git/GitHub. Students will explore IoT concepts, architecture, and hardware platforms like Arduino and Raspberry Pi. Additionally, they will learn about version control using Git and collaborative software development with GitHub. This lab equips students with practical skills essential for modern technology-driven applications.

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Define appropriate problem statement for real world problems.
CO2	Design the various modules of the project to provide a solution to the problem with the help of various design tools.
CO3	Present their work and prepare technical project report.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2							3					1
CO2	1	2	2	2	2	1	1		3	3			3	2
CO3	1	1	2		2		1	2	3	3	2		2	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	Internal Assessment	50%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	POE	50%	Practical/Oral Examination

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Course Contents:
Tending Technologies : Internet of Things, GIT, GITHUB
Introduction to IoT concepts and architecture. Hands-on with IoT platforms and devices (e.g., Arduino, Raspberry Pi). Building a basic IoT project (e.g., sensor data collection and visualization). Introduction to git and github.
Guidelines
1. Attendance & Participation: Active participation in hands-on sessions is mandatory. 2. Lab Assignments: Complete all practical exercises for IoT and Git/GitHub. 3. Project Development: Build a functional IoT project and maintain it using GitHub. 4. Collaboration & Teamwork: Work in teams for both IoT and GitHub-based projects. 5. Documentation: Maintain proper records of experiments, version history, and project progress. 6. Code Quality & Best Practices: Follow structured coding, commenting, and repository management standards.
Assessment: Participation in group activities: 20% Group project development and presentations: 40% Project demonstration: 10% Final reflection of the work: 30% **Note: Two practical sessions of 2 hours per week will be dedicated to project development, research, and hands-on training**

Course Code:	24CSEU4N08
Course Name:	Web Technology I

L	T	P	Credit
1		2	2

Course Prerequsites:

Basic knowledge of HTML, CSS and programming concepts.

Course Description:

This course introduces the basics of building interactive and dynamic websites using JavaScript and jQuery. Students will learn how to create and control web page content, handle user interactions, and use tools like AJAX for dynamic updates. The focus is on practical skills to develop responsive and user-friendly web applications, making websites more engaging and functional.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Understand the fundamentals of JavaScript and jQuery for creating dynamic web pages.
CO2	Apply JavaScript and jQuery for DOM manipulation and event handling.
CO3	Develop simple, interactive, and responsive web applications using JavaScript and jQuery.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2		2			1				1	2	
CO2	1	1	2		2			1				1	2	
CO3	1	1	2		2			1				1	2	
CO4														
CO5														

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	Internal	100%	Lab Assignment, Test, Quiz

D Y PATIL EDUCATION SOCIETY Deemed to be University Kasba Bawada, Kolhapur School of Engineering & Management KOLHAPUR

Course Contents:

Unit 1	**Introduction to Javascript**	**4 Hours**
JS Introduction, Getting Started, Syntax, Variables, Generating Output, Data Types, Operators, Events, Strings, Numbers, If…Else, Switch…Case, Arrays, Sorting Arrays, Loops,Functions, Objects		
Unit 2	**Advanced Javascript**	**4 Hours**
Date and Time, Math Operations, Type Conversions, Event Listeners, Event Propagation, Borrowing Methods, Hoisting Behavior, Closures, Strict Mode, JSON Parsing, Error Handling, Regular Expressions, Form Validation, Cookies, AJAX Requests, ES6 Features		
Unit 3	**Introduction to JQuery**	**4 Hours**
Introduction, Syntax, selectors, events, JQuery effects, JQuery HTML/CSS, JQuery traversing, JQuery form, JQuery misc		

Text Books:

1. JavaScript: The Definitive Guide by David Flanagan, O'Reilly Media
2. jQuery in Action by Bear Bibeault, Manning Publication

Reference Books:

1. JavaScript: The Complete Reference by Thomas A Powell, Fritz Schneider, Tata McGraw Hill
2. Head First jQuery by Ryan Benedetti, O'reilly Publication

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Course Code:	24CSEU4H10	L	T	P	Credit
Course Name:	Project Management Tools and Startup Ventures	1		2	2

Course Prerequsites:

Software Engineering, project Management Basic Concepts

Course Description:

This course explores the integration of technology with project management principles, emphasizing how computer engineering students can leverage advanced tools and strategies in managing projects and launching start-up ventures. The course covers project management methodologies, software tools, and real-world applications .

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Apply technology to optimize project planning, execution, and monitoring.
CO2	Dmonstrate practical skills in using project management tools and technologies
CO3	Learn the use of technology in start-up ventures and entrepreneurial projects

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			1		1						2			
CO2			1		3		3		2	2	2	2	3	
CO3			1		3		3		2	3	2	2	3	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation [50 Marks]	100%	Assignment, Test, Quiz, Seminar, Presentation, etc.

Course Contents:

Unit 1	Introduction	3 Hours
Project Management (PM) Fundamentals, People, Process, and Product, Technology Classic mistakes, PMI Processes, Software project phases, Organizational structures, Project charter, Statement of Work **(SOW)**		
Unit 2	**Project Management Methodologies**	**3 Hours**
Development lifecycle models, Project plans Work Breakdown Structures (WBS), Agile and Scrum: Principles and Practices,Comparing Methodologies: When to Use Which.		
Unit 3	**Project Planning and Scheduling Tools**	**3 Hours**
Introduction to Project Planning Software (e.g., MS Project, Jira, Asana), Creating Project Plans and Gantt Charts, Resource Allocation and Budgeting.		
Unit 4	**Vision and the Business Model & Innovation Strategies**	**4 Hours**
The Vision, The Mission Statement,The Value Proposition, The Business Model, Business Model Innovation in Challenging Markets, Core Competencies, Sustainable Competitive Advantage.First Movers Versus Followers, Imitation,Creativity and Invention, Types and Sources of Innovation, Technology and Innovation Strategy, New Technology Ventures.		

Text Books:

1. “Information Technology Project Management”, Kathy Schwalbe, Cengage Learning, 7/e, 2013.
2. "Technology Ventures From Idea to Enterprise",Thomas H. Byers, Richard C. Dorf, Andrew J., Nelson

Reference Books:

1. "Software Project Management", M. Cottrell and B. Hughes, McGraw-Hill, 5/e, 2009.
2. "Project Management Software Tools: A Guide to Choosing the Right Tools" by Michael S. Dobson
3. "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" by Eric Ries

Course Code:	23CSEU3V09
Course Name:	Environmental Studies - II

L	T	P	Credit
2			2

Course Prerequsites:

1. Understanding of Environmental Education course

Course Description:

The main objective of course is to create awareness among students regarding environmental issues and its impact on society. Knowledge regarding environmental components, its degradation and protection of environment is need for sustainable future ahead.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Understand the fundamentals of environmental chemistry and assess the impacts of toxic pollutants on ecosystems and human health.
CO2	Identify and evaluate green technologies and sustainable innovations for solving environmental problems.
CO3	Analyze global environmental challenges and climate change mitigation strategies, including national and international policy frameworks.
CO4	Acquire problem solving attitude through actual field experience and report it in the form of a field report.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1						2							
CO2							2							
CO3							2							
CO4							2							

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (ISE)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
	Mid Semester Exam	30%	50%ofcourse contents
	In Semester Evaluation (ISE)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	End Semester Examination (ESE)	50%	100%course contents

Course Contents:

Unit 1	**Environmental Chemistry & Toxicology**	**5 Hours**
Basics of environmental chemistry (air, water, soil interactions), Chemical composition of the atmosphere, photochemical smog, Water chemistry: pH, DO, alkalinity, hardness, Soil chemistry: nutrients, contamination, pH ,Toxic pollutants: Pesticides, Heavy Metals (Hg, Pb, Cd, As), POPs, Industrial pollution sources and pathways, Health impacts of toxic substances on humans and ecosystems, Environmental standards by WHO, CPCB, BIS		
Unit 2	**Green Technologies & Innovations**	**8 Hours**
Introduction to Green Technologies: definitions, scope, principles, Green Buildings: features, LEED/IGBC ratings, case studies in India, Sustainable construction materials: fly ash bricks, bamboo, recycled concrete, Electric mobility: EVs, battery technologies, government policies (FAME), Renewable Energy Innovations: Solar PV, Wind, Bioenergy, LED systems, Smart energy solutions: energy metering, demand-side management, Energy-efficient appliances: BEE labeling, star ratings		
Unit 3	**Global Environmental Issues & Climate Action**	**8 Hours**
Climate change science: greenhouse gases , Major impacts of climate change: sea level rise, extreme events, biodiversity loss, International environmental treaties and protocols: Kyoto Protocol, Montreal Protocol, Paris Agreement: India's INDC goals, India's National Action Plan on Climate Change (NAPCC), Carbon footprint: measurement, tools, reduction strategies, Net-zero emissions :pathways and technologies, Role of youth and civil society in climate action.ISO 14001:2015 – standards, implementation process, audits, Effluent Treatment Plant (ETP) and Sewage Treatment Plant (STP) processes, Corporate Social Responsibility (CSR) :legal framework, case studies.		
Unit 4	**Field Project Work**	**5 Hours**
Case studies based on field visit (Each student must complete a project on an environmental issue and propose solutions)		

Text Books:

1 Benny Joseph – Environmental Science and Engineering
Publisher: McGraw Hill Education,ISBN: 9789339221266.

2.Anubha Kaushik & C.P. Kaushik – Environmental Management, Publisher: New Age International Publishers, ISBN: 9788122419477.

3. S.M. Khopkar – Environmental Pollution Monitoring and Contro.
Publisher: New Age International Publishers, ISBN: 9788122404282

Reference Books:

4. Rajagopalan – Environmental Studies: From Crisis to Cure
Publisher: Oxford University Press
ISBN: 9780198067691
5. S.K. Dhameja – Environmental Studies
Publisher: S.K. Kataria & Sons
ISBN: 9789350141014
6. A.K. De – Environmental Chemistry
Publisher: New Age International Publishers
ISBN: 9788122419460
7. ISO 14001:2015 – Environmental Management Systems :Requirements with Guidance for Use
Publisher: International Organization for Standardization (ISO), ISBN: 9789267102970.
8. David T. Allen & David R. Shonnard: Green Engineering: Environmentally Conscious Design of Chemical Processes,Publisher: Pearson Education, ISBN: 9789332550479.
9. N. Basak – Environmental Engineering
Publisher: McGraw Hill Education
ISBN: 9789339205181
10. MoEFCC & NAPCC Policy Documents : Government of India, Available at: https://moef.gov.in