Walchand Institute of Technology, Solapur
(An Autonomous Institute)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Choice Based Credit System (CBCS)

Structure and Syllabus
for
S. Y. B.Tech. Artificial Intelligence and Machine Learning
W.E.F. 2026-27

Artificial Intelligence and Machine Learning

Vision

To nurture competent Artificial Intelligence and Machine Learning professionals with strong analytical skills, technical expertise and ethical responsibility for developing intelligent solutions to industrial and societal challenges.

Mission

- M1: To impart quality education in Artificial Intelligence and Machine Learning through a strong foundation in computing, data-driven technologies and intelligent systems.
- M2: To develop critical thinking, innovation and lifelong learning skills for designing and deploying AI-enabled solutions to real-world problems.
- M3: To promote research, industry interaction and professional ethics for developing responsible AI professionals.

Artificial Intelligence and Machine Learning

Program Educational Objectives (PEOs)

Graduates will apply

1. Strong knowledge in Artificial Intelligence, Machine Learning and Data Science to address industrial and societal computing requirements.
2. AI techniques to analyze complex problems and design intelligent, ethical and scalable solutions for real-world applications.
3. Pursue continuous learning, research and innovation to adapt to emerging technologies and build careers in industry, entrepreneurship and higher education.

Knowledge and Attitude Profile (WK)

WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs)	
PO 1	**Engineering Knowledge**: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO 2	**Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	**Design/Development of Solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	**Conduct Investigations of Complex Problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO 5	**Engineering Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO 6	**The Engineer and The World**: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO 7	**Ethics**: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	**Individual and Collaborative Team work**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	**Communication**: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning difference
PO 10	**Project Management and Finance**: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO 11	**Life-long Learning**: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

1. Apply mathematical, statistical, and algorithmic foundations to analyse data and solve problems using Artificial Intelligence and Machine Learning techniques.
2. Design, implement, and evaluate AI and ML models for intelligent tasks such as prediction, classification and decision-making using appropriate tools and platforms.
3. Develop ethical, efficient, and sustainable AI-based solutions by integrating machine learning methods, domain knowledge, and software engineering practices for industrial and societal applications.

Artificial Intelligence and Machine Learning

Legends Used	
L	Lecture Hours / week
T	Tutorial Hours / week
P	Practical Hours / week
FA	Formative Assessment
SA	Summative Assessment
ESE	End Semester Examination
ISE	In Semester Evaluation
ICA	Internal Continuous Assessment
POE	Practical and Oral Exam
OE	Oral Exam
MOOC	Massive Open Online Course
HSS	Humanity and Social Science
NPTEL	National Programme on Technology Enhanced Learning
F.Y.	First Year
S.Y.	Second Year
T.Y.	Third Year
B. Tech.	Bachelor of Technology

Artificial Intelligence and Machine Learning

Course Code Format

2	**1**	**I**	**T**	**U/P**	**2**	**C**	**C**	**1**	**T/L**
Year of Syllabus revision		Program Code		U-Under Graduate P-Post Graduate	Semester No./ Year1/2/3/…8	Course Type		Course Serial No 1-9	T-Theory, L-Lab session P- Programming

Program Code	
CS	Computer Science and Engineering
AI&ML	Artificial Intelligence and Machine Learning
Course Type	
BS	Basic Science
ES	Engineering Science
HU	Humanities & Social Science
MC	Mandatory Course
CC	Core Compulsory Course
SN*	Self-Learning **N*** *indicates the serial number of electives offered in the respective category*
EN*	Core Elective **N*** *indicates the serial number of electives offered in the respective category*
ON*	Open Elective **N*** *indicates the serial number of electives offered in the respective category*
SK	Skill Based Course
SM	Seminar
MP	Mini project
PR	Project
IN	Internship

Sample Course Code	
25AIU3CC1T	Mathematical Foundation for AIML

Artificial Intelligence and Machine Learning

B. Tech Semester III

Course Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
		L	T	P		Theory	OE/ POE	ISE	ICA	
25AIU3CC1T	Mathematical Foundation for AIML	3	--	--	3	60		40		100
25AIU3CC2T	Data Structures	2	--	--	2	60		40		100
25AIU3CC3T	Artificial Intelligence	2	--	--	2	60	--	40		100
25##U3ON*4T	Open Elective-I	2	--	--	2	60		40		100
25##U3ON*4A	Open Elective-I (Tutorial)	--	1	--	1	--	--	--	25	25
24CMU3EM5A	Entrepreneurship development	1	1	--	2	--	--	--	50	50
24##U3MD6T	Multidisciplinary Minor I	2	--	--	2	60	--	40	--	100
25CMU3VE7T	Universal Human Values	2	--	--	2	50*	--	--	--	50
	Total	**14**	**2**	**--**	**16**	**350**	**--**	**200**	**75**	**625**
25AIU3CC2L	Data Structures Lab	--	--	2	1	--	50	--	25	75
25AIU3CC3L	Artificial Intelligence Lab	--	--	2	1	--	--	--	25	25
25AIU3CC8P	Python Programming	1	--	2	2	--	50	25	25	100
25AIU3FP9L	Community Engagement Project /Field Project	--	--	4	2	--	--	--	50	50
	Subtotal	**1**	**--**	**10**	**6**	**--**	**100**	**25**	**125**	**225**
	Grand Total	**15**	**2**	**10**	**22**	**350**	**100**	**225**	**200**	**875**

Artificial Intelligence and Machine Learning

B. Tech Semester IV

ourse Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
		L	T	P		Theory	OE/ POE	ISE	ICA	
25AIU4CC1T	Theory of Computations	3	--	--	3	60	--	40	--	100
25AIU4CC2T	Computer Networks	2	--	--	2	60	--	40	--	100
25AIU4CC3T	Machine Learning	2	--	--	2	60	--	40		100
25AIU4EM4T	Project Management	2	--	--	2	60	--	40	--	100
25##U4OE5T	Open Elective II	2	--	---	2	60	--	40	--	100
25##U4OE5T	Open Elective II (Tutorial)	--	1	--	1	--	--	--	25	25
24##U4MD6T	Multidisciplinary Minor II	1	--	--	1	--	--	50	--	50
24CMU4AE7T	General Proficiency	1	1	--	2	--	--	--	50	50
24CMU4VE8T	Professional Ethics	2	--	--	2	--	--	50	--	50
	Total	**15**	**2**	**--**	**17**	**300**	**--**	**300**	**75**	**675**
25AIU4CC2L	Computer Networks Lab	--	--	2	1	--	--	--	25	25
25AIU4CC3L	Machine Learning Lab	--	--	2	1	--	25	--	25	50
25AIU4CC9P	OOP using JAVA	1	--	2	2	--	50	25	25	100
25AIU4VE2T	UI/UX Design (Web)	1	--	2	2	--	--	25	25	50
24##U4MD10P	Multidisciplinary Minor II	--	--	2	1	--	--	--	25	25
	Subtotal	**2**	**--**	**10**	**7**	**--**	**75**	**50**	**125**	**250**
	Grand Total	**17**	**2**	**10**	**24**	**300**	**75**	**350**	**200**	**925**
24CMU4MC2T	Environmental Science	1	--	--	--	50*	--	--	--	50

Mandatory Course: Environmental Science course will be taught in both Semester III and Semester IV whereas the assessment will be in Semester IV as End Semester Examination.

Note:

- N* indicates the serial number of electives offered in the respective category
- ## indicates program code of offering Programme
- *The examination will be MCQ based
- Internal Continuous Assessment (ICA): ICA shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation, etc., as applicable.

List of Open Electives:

Open Electives- I (Semester-III)

Sr. No.	Subject Code	Subject
1	25CEU3O15T	Managerial Economics
2	25MAU3O25T	Renewable Energy
3	25ETU3O35T	Sustainable Development
4	25CSU3O45T	Management Information Systems
5	25ECU3O55T	Fundamentals Of Digital Marketing
6	25ITU3O65T	Cyber Laws

Open Electives- II (Semester-IV)

Sr. No.	Subject Code	Subject
1	25GEU4O14T	Higher Engineering Mathematics
2	25GEU4O24T	Advanced Engineering Mathematics
3	25GEU4O34T	Applied Mathematics
4	25GEU4O44T	Statistics and Fuzy logic
5	24GEU4O54T	Applied Statistics
6	25GEU4O64T	Computational and Optimization Techniques

- For Open Elective (OE) III in Semester V:
  1. Students are required to enrol in one of the courses of a minimum duration of 8 weeks offered on the SWAYAM/NPTEL platform. The list of courses will be finalized and released by the Board of Studies each year.
  2. List of MOOC courses will be provided by the department depending on the availability of the courses in that semester under NPTEL / Swayam or other recognized MOOC Platforms as per suggestions by the BoS.
  3. Students may enrol for the course in Semester III, IV or V. They must complete all assignments and appear for the certification examination conducted by SWAYAM/NPTEL.
  4. Students must pass the examination by the end of Semester V. The marks earned by the student in final assessment of this MOOC course/courses will be appropriately scaled and transferred to Open Elective (OE) III in Semester V.

- **Multidisciplinary Minor (MDM) Courses**

  Students can choose one of the below mentioned Multidisciplinary Minor Program during the start of Semester III.

Sr. No.	MDM Program	MDM I (Sem III)	MDM II (Sem IV)	MDM III (Sem V)	MDM IV (Sem VI)	MDM V (Sem VII)
1	Mechanical and Automation Engineering	Manufacturing Processes and Mechanisms	Machine Drawing and 3DModeling	Automotive Engineering and Robotics	Additive Manufacturing	Thermal Systems
2	Civil Engineering	Smart Buildings	Geoinformatics	Environmental Impact Assessment	Infrastructural Systems	Disaster Preparedness and planning
3	Electronics and Telecommunication Engineering	Fundamentals of Electronic Circuits	Electronics Design and Prototyping	Introduction to Embedded Systems	Fundamentals of Communication Techniques	Enclosure and Communication Design for IoT

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-III

25AIU3CC1T - MATHEMATICAL FOUNDATION FOR AIML

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Credits	3	**ISE**	40 Marks

Introduction:

This course provides the mathematical and statistical foundations required for Artificial Intelligence and Machine Learning. It covers probability distributions, descriptive statistics, correlation, regression, estimation, and hypothesis testing for data analysis and decision-making. The course equips students with essential techniques for understanding data, modelling relationships among variables, and drawing reliable inferences from data-driven systems.

Course Prerequisite: Basic knowledge of algebra, matrices, and elementary statistical concepts.

Course Objectives:

1. To introduce the fundamental concepts of probability theory and random variables for modelling uncertainty in engineering problems.
2. To understand and use descriptive statistical techniques for organizing, analyzing, and interpreting data.
3. To introduce methods for measuring and interpreting the relationship between two variables using correlation techniques.
4. To develop skills in modelling and predicting relationships between variables using regression and curve fitting techniques.
5. To introduce statistical inference techniques for estimation and hypothesis testing in Engineering applications.

Course Outcomes:

After completing this course, student shall be able to –

1. Apply fundamental concepts of probability and probability distributions to model uncertainty in engineering problems.
2. Collect, organize, and analyze data using appropriate descriptive statistical measures.
3. Determine and interpret the degree of relationship between variables using correlation techniques.
4. Develop regression models and perform curve fitting for prediction and interpolation of data.
5. Apply estimation and hypothesis testing techniques to draw statistical inferences in engineering applications.

Unit – I	**Probability Distributions**	**6 Hours**

Introduction to probability, Bayes' theorem, Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Properties of expectation and variance (without proofs). Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution.

Unit – II	**Descriptive Statistics**	**6 Hours**
Sources of data: primary and secondary, Sampling techniques, Frequency distribution, Measures of central tendency: Mean, Median, Mode (for Grouped and Ungrouped Data), Measures of dispersion: Range, Variance, Standard Deviation (for Grouped and Ungrouped Data), Quartiles, Central Moments, Shape of distribution: Skewness, Kurtosis.		
Unit – III	**Correlation**	**6 Hours**
Introduction to Correlation coefficient, Coefficient of correlation by Karl Pearson's method, Spearman 's rank correlation Coefficient. Properties of Karl Pearson's correlation coefficient and Spearman 's rank correlation coefficient.		
Unit – IV	**Linear Regression Analysis**	**6 Hours**
Lines of regression of bivariate data. Angle between the regression lines, Curve fitting by Least square principle (straight-line, second-degree parabola), Lagrange's interpolation method.		
Unit – V	**Estimation and hypothesis testing**	**6 Hours**
Types of Estimates, Properties of a Good Estimator, Maximum error of estimation, Interval Estimation, Confidence Intervals: For population mean, For population proportion, For the difference between two means & proportions, Null and Alternative Hypothesis, Type I and Type II errors, Level of Significance, One-tailed and Two-tailed tests, Z-test, t-test, Chisquare test.		
Internal Continuous Assessment (ICA): ICA shall consist of a minimum of five assignments / tutorials based on the above syllabus.		
Text Books		
1. Textbook of Engineering Mathematics by N.P. Bali, Manish Goyal, Laxmi Publications, New Delhi. 2. Applied Statistics and Probability for Engineers by Douglas C. Montgomery and George C. Runger, John Wiley & Sons, New York.		
Reference Books		
3. Probability and Statistics with Reliability, Queuing, and Computer Science Applications by Kishor S. Trivedi, John Wiley & Sons, New Delhi. 4. Introductory Statistics by Sheldon M. Ross, Academic Press, Elsevier, New Delhi.		

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-III

25AIU3CC2T – DATA STRUCTURES

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ESE**	60 Marks
Practical	2 Hours/week	**ISE**	40 Marks
Credits	3	**ICA**	25 Marks
		POE	50 Marks

Introduction:

This course introduces various data structures like stack, queue, linked list, trees, graphs. Course includes implementation of various operations of these data structures and some applications.

Course Prerequisite:

This course requires prior knowledge of any basic programming languages.

Course Objectives:

1. To introduce students to various data structures.
2. To develop programming skills to implement and analyze linear and nonlinear data structures.
3. To identify and apply the suitable data structure for problem solving.

Course Outcomes:

Students will be able to
1. Describe linear and non-linear data structures.
2. Implement abstract data structures.
3. Analyze and Implement Tree and Graph data structures.
4. Identify appropriate usage of data structures for a given problem.

Unit – I	**Introduction to Data Structures & Stack**	**4 Hours**

What is Data Structure, types of data structures – static, dynamic, primitive, non-primitive, linear, non-linear. Stack Definition, representation, operations, implementation, applications like conversion of polish notations, evaluation of postfix expressions.

Unit – II	**Queues**	**4 Hours**

Definition, representation, operations, Implementation of Linear Queue, Circular Queue, Priority Queue

Unit – III	**Lists**	**7 Hours**

Definition, representation, operations, Types of Lists: Singly Linked List, Doubly Linked List, Circular Linked List, stack using linked list, queue using linked list, application of linked list: addition and subtraction of two polynomials.

Unit – IV	**Trees**	**6 Hours**
Definition, traversal, linked implementation, operations on Binary Trees and Binary Search Trees, Introduction Multiway Trees, B trees, B+ trees.		
Unit – V	**Height Balanced Trees**	**4 Hours**
AVL Trees: Definition, height of an AVL Tree, insertion, deletion of node in AVL Trees, Single and Double rotation of AVL Trees.		
Unit – VI	**Graphs**	**5 Hours**
Definition, undirected and directed graphs, graph terminologies, computer representation of graphs, graph traversal methods: Depth First Search and Breadth First Search.		

Internal Continuous Assessment (ICA):
ICA will consist of **at least 10 programming assignments** using open-source AI tools and frameworks based on the following topics:

1. Stack
2. Queue, Circular Queue
3. Singly Linked list, Doubly Linked List, Circular Linked list.
4. Stack, Queue using Linked list
5. Additional of polynomials using Linked list
6. Binary Search Tree
7. Graph

Text Books

5. Data Structure and Program Design in C by Robert Kruse/C.L.Tonda/BruceLeung second edition, Pearson Education, Prentice Hall.
6. Data Structures: A Pseudo Approach with C. by Richard.F.Gilberg & Behrouz A. Forouzan, second edition, Cengage Learning
7. Data Structure using C and C++ by Rajesh. K. Shukla, Wiley Publication

Reference Books

1. Data Structures using C and C++, second edition by Yedidyah Langram, Moshe J, Augensteen, Aason. M. Tanenbaum.
2. Data Structures and Algorithms by Prof. Maria S. Rukadikar, Shroff Publications.
3. Data Structures Through C in Depth by S.K.Shrivastava, Deepali Shrivastava, BPB Publications
4. Fundamentals of Data Structures, Sartaj Sahni, University Press
5. Data Structures through C, Yashwant Kanetkar, BPB Publications

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Third Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-III

25AIU3CC3T -ARTIFICIAL INTELLIGENCE

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ESE**	60 Marks
Practical	2 Hours/week	**ISE**	40 Marks
Credits	3	**ICA**	25 Marks

Course Objectives:

1. To explore the foundational concepts, history, and real-world applications of Artificial Intelligence while understanding the structure and functionality of intelligent agents in different environments.
2. To develop problem-solving abilities using various search strategies and enhance knowledge representation and reasoning skills through logical and ontological approaches.
3. To express and analyze uncertainty through probabilistic models and Bayesian networks, as well as to grasp different learning paradigms for knowledge acquisition in artificial intelligence.

Course Outcomes:

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

1. Demonstrate an understanding of AI principles, its historical evolution, and the role of intelligent agents in decision-making across various domains.
2. Apply search algorithms and knowledge representation techniques to represent, analyze, and solve AI-related problems effectively.
3. Apply probabilistic reasoning model, including Bayes' Rule and Bayesian networks, to manage uncertainty and implement supervised, unsupervised, and reinforcement learning methods for decision-making.

Unit – I	**Overview of Artificial Intelligence**	**6 Hours**

What is AI-Definition, Foundations of AI (Philosophy, Mathematics, Neuroscience, Psychology, Computer Science), History, and Scope of AI, The state of the Art-Applications of AI in Real-World Scenarios.

Unit – II	**Intelligent Agents**	**7 Hours**

Structure and Function of Intelligent Agents, Types of Agents: Simple reflex agent, Model based reflex agent, Goal-Based agent, Utility-Based agent, Learning Agents, The nature of Environment and types: Fully vs. Partially Observable, Real-World Examples of Intelligent Agents

Unit – III	**Problem-Solving through Search**	**9 Hours**

State-Space Representation, Uninformed or blind Search Techniques: BFS, DFS, Informed or Heuristic Search Strategies: Greedy Best-First Search, A*, AO* Algorithm, Adversarial Search: Minimax Algorithm and Alpha-Beta Pruning.

Unit – IV	**Knowledge Representation and Reasoning**	**7 Hours**

Logic, Propositional logic, First order logic: Representation, Syntax and Semantics: Models for First order logic, symbols & Interpretation, terms, Atomic sentences, Complex sentences quantifiers. Ontological-Engineering: Categories and objects, events.

Unit – V	Representing and Reasoning with Uncertain Knowledge	8 Hours
Quantifying uncertainty: Acting under uncertainty: Summarizing uncertainty, Uncertainty and rational decisions, Basic Probability Notation: What probabilities are about, The language of propositions in probability assertions, Probability axioms and their reasonableness, Bayes' Rule and its use: Applying Bayes' rule: The simple case, Using Bayes' rule: Combining evidence, The semantics of Bayesian networks.		
Unit – VI	**Learning and Knowledge Acquisition**	**8 Hours**
Forms of Learning: Supervised, Unsupervised, Semi-supervised, Statistical learning, Reinforcement Learning, Q-learning, Sample applications.		

Internal Continuous Assessment (ICA):

ICA will consist of **at least 10 programming assignments** using open-source AI tools and frameworks based on the following topics:

1. Intelligent agents
2. Problem solving through search
3. First order logic
4. Bayesian Networks
5. Bayes' Rule
6. Learning and Knowledge Acquisition using Supervised and unsupervised algorithms
7. Statistical Learning
8. Q-learning.

Text Books

1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig, Prentice Hall.
2. "A First Course in Artificial Intelligence" by Deepak Khemani, McGraw Hill Education (India).
3. "Introduction to Artificial Intelligence & Expert Systems" by Dan W. Patterson, PHI.

Reference Books

1. "Artificial Intelligence" by Elaine Rich and Kevin Knight, Tata McGraw Hill.
2. "Machine Learning" by Tom M. Mitchell, McGraw Hill.
3. "Pattern Recognition and Machine Learning" by Christopher M. Bishop, Springer.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-III

25AIU3O75T - MANAGEMENT INFORMATION SYSTEMS (Open Elective-I)

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ESE**	60 Marks
Credits	2	**ISE**	40 Marks
Tutorial	1	**ICA**	Marks
Credits	1		

Course Objectives:

1. Understand the role and impact of information systems in global business and Organizational strategy.
2. Examine ethical, social issues of information systems and understand IT infrastructure trends.
3. Explore information systems security and understand e-commerce dynamics.

Course Outcomes:

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

1. Identify how information systems transform business processes and competitive strategies.
2. Analyze ethical implications and evaluate IT infrastructure trends for business efficiency.
3. Develop strategies for information system security and understand e-commerce principles.

SECTION-I

Unit – I	**Information Systems in Global Business Today**	**6 Hours**

The Role of Information Systems in Business Today, how information systems are transforming business, what is new in information system. Business Processes and Information systems, Tools and technologies for collaboration and social business

Unit – II	**Information Systems, Organizations, and Strategy**	**4 Hours**

Organizations and its features, How Information Systems Impact on Organizations, Competitive strategies using information systems, Challenges posed by strategic information systems

Unit – III	**Ethical and Social Issues in Information Systems**	**5 Hours**

Understanding Ethical, Social, political issues raised by information systems, principles for conduct in ethical decisions, Contemporary information systems technology. Challenges to the protection individual privacy and intellectual property.

SECTION-II		
Unit – IV	**IT Infrastructure and Emerging Technologies**	**6 Hours**
IT Infrastructure, Infrastructure Components, Contemporary Hardware Platform Trends, Contemporary Software Platform Trends, Organizing Data in a Traditional File Environment, Major Capabilities of Database Management Systems, Using Databases to Improve Business Performance and Decision Making, Managing Data Resources		
Unit – V	**Securing Information Systems**	**4 Hours**
System Vulnerability and Abuse, Business Value of Security and Control, Organizational Framework for Security and Control, Technologies and Tools for safeguarding Information Resources		
Unit – VI	**E-commerce: Digital Markets, Digital Goods**	**5 Hours**
Features of e-commerce, Digital Markets, Digital Goods, principles ecommerce business and revenue models, e-commerce business-to-business transaction, Role of M-commerce in business & its applications		

Internal Continuous Assessment (ICA):

Teacher should prepare a group of 4-5 students and assign them any case study based on the above chapters. These are few topics for case studies are

1. Digital Transformation at Indian Railways
2. Data-Driven Decision Support Systems in Reliance Indu
3. Digital Health Mission and e-Hospital Systems
4. Unified Payments Interface (UPI) System
5. Reliance JioMart's E-commerce Strategy
6. SAP ERP Implementation at Tata Steel/ Infosys
7. Flipkart's Supply Chain Innovation
8. TCS's Use of TCS iON for HR Management
9. HDFC Bank's Use of CRM for Customer Engagement
10. Delhivery's Technology-Driven Logistics

Text Books

1. Management Information Systems: Managing the Digital Firm, 15th Edition by Kenneth C. Laudon and Jane Laudon, Pearson Education
2. Management Information Systems: Sashikala Parimi, Kogent Learning Solutions Inc.

Reference Books

1. Information Technology for Management: Transforming Organizations in the Digital Economy, Efraim Turban,6th Edition, Wiley Edition
2. Management Information Systems: Shubhalakshmi Joshi, SmitaVaze, Biztantra

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-III

24CMU3EM5A - ENTREPRENEURSHIP DEVELOPMENT

Teaching Scheme		**Examination Scheme**	
Lectures	1 Hour/week	**ICA**	50 Marks
Tutorial	1 Hour/week	**Credits**	2

Introduction:

Entrepreneurship education in India has gained relevance in today's context. Education in the area of entrepreneurship helps students to develop skills and knowledge, which could benefit them for starting, organizing and managing their own enterprises. Entrepreneurship education encourages innovation, fosters job creation, and improves global competitiveness. This course will focus on key attributes of Entrepreneurship: Qualities of a successful entrepreneur, Entrepreneurship Development Programmes, Ideation Techniques, Business Plan Formulation, and Different Support Systems. To sum up, the course will make students to have an understanding of the complete entrepreneurial ecosystem.

Prerequisite:

No special prerequisite for this course.

Course Objectives:

1. To familiarize with entrepreneurship and its significance in national development
2. To develop skills required to establish and run a successful enterprise
3. To acquaint with the options available with new entrepreneurs
4. To formulate business plan/project report for a startup
5. To acquaint with support system associated with entrepreneurial development

Course Outcomes:

After completing this course, student shall be able to –
1. Identify the qualities required to become a successful entrepreneur.
2. Select the proper type of Entrepreneurship Development Programmes.
3. Identify the business opportunities that fit the individual or the group & prepare a business plan
4. Select a proper funding option for establishing new enterprise.

Unit – I	**Entrepreneur**	**3 Hours**

Concept, meaning and definitions of entrepreneur, need of entrepreneur, intrapreneur, social entrepreneur, qualities of entrepreneurs, types of entrepreneurs.

Unit – II	**Entrepreneurship Development**	**4 Hours**

Concept of entrepreneurship, Entrepreneurship Development Programmes (EDPs)- meaning & need of EDPs, course content & curriculum of EDPs, phases of EDPs, problems of EDPs

Unit – III	**Entrepreneurial Project Development**	**4 Hours**
Idea generation–sources and methods, preparation of a project report/ business plan including: market plan, financial plan, operational plan, HR plan, working capital management, break even analysis etc.		
Unit – IV	**Small-Medium Enterprises and Support Systems**	**3 Hours**
Meaning and definition of Micro, Small & Medium Enterprises, forms of business ownership, Funding options available, role of government organization to support business.		

Internal Continuous Assessment (ICA):
Students of a batch should be divided into groups (consisting of maximum five members) to carry out the following tasks:
1. Two case studies on successful entrepreneurs
2. Two case studies on failure of businesses
3. Idea generation & selection of an idea for business
4. Preparation of project report / business plan for starting a small unit and presentation on the same.

Text Books

1. Entrepreneurial Development, Dr. S. S. Khanka, S. Chand Publications
2. Small-Scale Industries and Entrepreneurship - Vasant Desai, Himalaya Publishing House
3. Entrepreneurship, Alpana Trehan, Dream Tech Press

Reference Books

1. Dynamics of Entrepreneurial Development and Management - Vasant Desai, Himalaya Publishing House
2. Entrepreneurship & Small Business, Michael Schaper, Thierry Volery, Pauli Weber, Kate Lewis, Wiley Publication
3. Entrepreneurship, Robert Hisrich, Michael Peters, Dean Shepherd, Sabyasachi Sinha, McGraw Hill Publication

E-resources

1. https://archive.nptel.ac.in/courses/127/105/127105007/

Internal Continuous Assessment (ICA):
Students of a batch should be divided into groups (consisting of maximum five members) to carry out the following tasks:
1.Two case studies on successful entrepreneurs
2.Two case studies on failure of businesses
3.Idea generation & selection of an idea for business
4.Preparation of project report /business plan for starting a small unit and presentation on the same.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(An Autonomous Institute)
Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-III

25CMU3VE7T -UNIVERSAL HUMAN VALUES

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ESE**	50 Marks
Credits	2		

Introduction:

The salient features of this course are:

1. It presents a universal approach to value education by developing the right understanding of reality (i.e. a worldview of the reality "as it is") through the process of self-exploration.
2. The whole course is presented in the form of a dialogue whereby a set of proposals about various aspects of the reality are presented and the students are encouraged to self-explore the proposals by verifying them on the basis of their natural acceptance within oneself and validate experientially in living.
3. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information.
4. While introducing the holistic worldview and its implications, a critical appraisal of the prevailing notions is also made to enable the students discern the difference on their own right.

Course Prerequisite:

None. UHV-I Universal Human Values – Introduction (desirable)

Course Objectives:

This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way. Holistic, Value-Based Education for Realising the Aspirations articulated in NEP2020.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

Course Outcome:

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

1. Distinguish between values and skills; understand the harmony in the self and human being.
2. Analyze the harmony in the family, society, and nature leading to an understanding of the holistic perception of harmony.
3. Demonstrate understanding of harmonious relationships in the family and society through discussions, case studies, and value-based reflections.
4. Identify human responsibilities toward nature and propose value-based actions that promote environmental harmony.

Unit – I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:	7 Hours

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations.
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority.
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations, understanding and living in harmony at various levels.

Unit – II	Understanding Harmony in the Human Being - Harmony in Myself!	7 Hours

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' –Sukh and Suvidha
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail.
6. Programs to ensure Sanyam and Swasthya

Unit – III	Understanding Harmony in the Family and Society- Harmony in Human Relationship	8 Hours

1. Understanding Harmony in the family – the basic unit of human interaction
2. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
3. Understanding the meaning of Vishwas; Difference between intention and competence.
4. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family

Unit – IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	8 Hours

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

Text Books

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2. The teacher's manual: R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

Reference Books

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprint e 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, Jeevan Vidyaek Parichay, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Relevant Websites, Movies and Documentaries

1. Value Education websites, http://uhv.ac.in,http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story
6. Gandhi A., Right Here Right Now, Cyclewala Productions
7. AICTE On-line Workshop on Universal Human Values Refresher Course-I Handouts
8. UHV-I handouts

https://drive.google.com/drive/folders/16eOka8AoBpLGlCDajRvk4MXgfXQWzFCB?usp=sharing

9. UHV-II handouts

https://drive.google.com/drive/folders/15eHkMVguzRBDrb65GFi7jMN6UEP5JEk1?usp=sharing

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-III

25AIU3CC8P -PYTHON PROGRAMMING

Teaching Scheme		**Examination Scheme**	
Lectures	1 Hour/week	**ISE**	25 Marks
Practical	2 Hours/week	**ICA**	25 Marks
Credits	2	**POE**	50 Marks

Introduction:

Python is a remarkably powerful, general-purpose, high-level dynamic programming language that can be used in a wide range of application fields. Python supports a variety of programming paradigms, including imperative, functional, and object-oriented.

Course Prerequisite:

Basic knowledge of any programming language including C, C++, Java.

Course Objectives:

After successful completion of this course, students will be able to:

1. Understand the fundamentals of Python programming and its relevance to AI and ML applications
2. Develop structured programs using Python's core data types and control structures
3. Implement modular and reusable code using functions and Python modules
4. Apply object-oriented programming concepts in Python
5. Perform file handling and basic data processing using Python libraries.
6. Build problem-solving ability through hands-on programming and mini-projects relevant to AI/ML.

Course Outcomes:

On completion of the course, the student will be able to:

1. Apply Python syntax, control structures, and core data structures to develop correct and efficient programs for problem solving.
2. Design and implement modular and object-oriented Python programs using functions, classes, and exception handling.
3. Use Python libraries and file handling techniques to perform basic data processing and analysis relevant to Artificial Intelligence and Machine Learning applications.

Unit – I	**Introduction to Python Programming**	**2 Hours**

Introduction to Python, Python features and applications in AI & ML, Python installation and execution

Python keywords, identifiers, variables, Input and output functions, Indentation and code structure

Unit – II	**Control Structures and Functions**	**2 Hours**

Conditional statements: if, if-else, elif. Looping constructs: for, while, break, continue, pass

Functions: Defining functions, Function arguments (positional, keyword, default) Return values, Recursive functions

Unit – III	**Python Data Structures**	**3 Hours**
Lists: operations, slicing, methods. Tuples: immutability and use cases. Sets: operations and applications. Dictionaries: key-value operations. List comprehensions		
Unit – IV	**Object-Oriented Programming in Python**	**3 Hours**
Introduction to OOP concepts. Classes and objects, Constructors and destructors, Inheritance, Polymorphism, Encapsulation		
Unit – V	**File Handling and Exception Handling**	**3 Hours**
File operations: read, write, append, working with text files, Exception handling: try, except, finally, raise, User-defined exceptions		
Unit – VI	**Introduction to Python Libraries for AI/ML**	**3 Hours**
Overview of Python libraries. NumPy basics: arrays, operations. Introduction to Pandas: Series and Data Frame. Basic data visualization using Matplotlib		

Practical Component (Suggested)

- **Minimum 8–10 experiments based on the following:**
  1. Python environment setup
  2. Basic programs: input/output, arithmetic operations
  3. Programs using loops and conditionals
  4. Function-based problem solving
  5. Programs using lists, dictionaries, and sets
  6. Simple data processing tasks
  7. Class-based programs
  8. Inheritance and polymorphism examples
  9. File handling programs
  10. Exception handling examples
  11. Simple numerical computations using NumPy
  12. Data handling using Pandas
  13. Basic plots using Matplotlib
- **One mini-project related to AI/ML such as:**
  1. Student performance analysis
  2. Simple recommendation system (logic-based)
  3. Data visualization of real datasets

Internal Continuous Assessment (ICA) – 25 Marks

- Practical performance: 10 Marks
- Assignments / Quizzes: 10 Marks
- Mini Project / Case Study: 5 Marks

Suggested Textbooks

1. **Mark Summerfield**, *Programming in Python 3*, Second Edition
2. **Reema Thareja**, *Python Programming Using Problem Solving Approach*, Oxford University Press
3. **Guido van Rossum**, *Python Tutorial*, Python Software Foundation

Reference Books
1. **Mark Lutz**, *Learning Python*, O'Reilly Media 2. **Wes McKinney**, *Python for Data Analysis*, O'Reilly Media
E-resources
1. Python documentation- https://docs.python.org/3/ 2. Numpy- https://numpy.org/doc/ 3. Pandas- https://pandas.pydata.org/docs/ 4. Matplotlib- https://matplotlib.org/stable/index.html

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

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Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-III

25AIU3FP9L -COMMUNITY ENGAGEMENT PROJECT/ FIELD PROJECT

Teaching Scheme		**Examination Scheme**	
Practical	4 Hours/week	**ICA**	50 Marks
Credits	2		

Introduction:

Community Engagement Project/ Field Project is an experiential learning strategy that integrates meaningful community engagement with instruction, participation, learning and community development. It applies the experience to personal and academic development. It is meant to link the community with the institutes for mutual benefit. The community will be benefited with the focused contribution of the students for the village/ local development. The institute finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Course Objectives:

1. To sensitize the students to the living conditions of the people who are around them To help students to realize the harsh realities of the society
2. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
3. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems
4. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections
5. To help students to initiate developmental activities in the community in coordination with public and government authorities

Course Outcomes:

After completing this course, student shall be able to -

1. Apply the knowledge to solve real-world problems.
2. Demonstrate complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
3. Develop interpersonal skills, particularly the ability to work well with others, and build leadership and communication skills.
4. Improve social responsibility and citizenship skills.
5. Develop connections with professionals and community members for learning and career opportunities

Procedure:

- Form a group of not more than 5 students.
- A mentor/guide will be allotted for each group.
- Students should finalize a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay.
- Students may work in close association with Non-Governmental Organizations like Lions
- Club, Rotary Club, etc. or with any NGO actively working in that habitation
- Then, they should conduct a preliminary survey including the socio-economic conditions of the allotted habitation, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas.
- If required, a survey form based on the type of habitation (rural, urban etc.) should be prepared before visiting the habitation.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats may be aligned for the survey.

Students should prepare a report which should include the following points.

- Introduction
- Primary Data obtained through survey/field visit
- Analysis of collected data
- Proposed Solution

Students may take help from different government departments like

- Agriculture
- Health
- Marketing and Cooperation
- Animal Husbandry
- Horticulture
- Fisheries
- Sericulture
- Revenue and Survey
- Natural Disaster Management
- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy

Examples of community engagement / field projects are as below:

- Study of per capita domestic water consumption in the selected colonies in the ward
- Study and characterization of domestic waste generation in the ward
- Analysis of depot level operations data
- Study of depot level maintenance processes
- Study and mapping of open drains in the ward
- Study of availability and access of public toilets in the ward
- Study and mapping of community spaces in the ward

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(An Autonomous Institute)
Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-IV

25AIU4CC1T -THEORY OF COMPUTATION

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hours/week	**ESE**	60 Marks
Credits	3	**ISE**	40 Marks

Introduction:

Theory of computation lays a strong foundation for a lot of abstract areas of computer science. TOC teaches you about the elementary ways in which a computer can be made to think. Any algorithm can be expressed in the form of a finite state machine and can serve as a really helpful visual representation of the same. Sometimes, the finite state machines are easier to understand thus helping the cause furthermore.

Course Prerequisite:

Students should have prior knowledge of Discrete Mathematical Structure

Course Objectives:

1. To introduce the computational principles to build regular expressions for a given regular language.
2. To design different types of automata.
3. To study context free grammar.
4. To design different types of Pushdown automata and Turing machines.

Course Outcomes:

Students will be able to
1. Build regular expressions for a given language.
2. Design different types of automata.
3. Identify ambiguity in a grammar and convert into unambiguous grammar and normal forms.
4. Design pushdown automata and Turing machines for a given language.

Unit – I	**Regular Expressions**	**5 Hours**

Regular expressions & corresponding regular languages, examples and applications, unions, intersection & complements of regular languages

Unit – II	**Finite Automata**	**6 Hours**

Finite automata definition and representation, non-deterministic F.A., NFA with^ transitions, Equivalence of DFA & NFA

Unit – III	**Kleen's Theorem**	**5 Hours**

Statements & proofs, minimizing number of states in an FA, Basics of Moore and Mealy Machines

Unit – IV	**Grammars & Languages**	**6 Hours**
Definition and types of grammars and languages, derivation trees and ambiguity, CNF notations, Union, Concatenation and*'s of CFLs, Eliminating ^ production and unit productions from a CFG, Eliminating useless variables from a Context Free Grammar.		
Unit – V	**Pushdown Automata**	**7 Hours**
Definition, deterministic PDA & types of acceptance, equivalence of CFGs & PDAs.		
Unit – VI	**CFL's & Non CFL's**	**4 Hours**
Pumping Lemma & examples, inter section and complements.		
Unit – VII	**Turing machines**	**6 Hours**
Models of computation, definition of TM as language Acceptors, Combining Turing machines, computing function with a TM		
Unit – VIII	**Variations in TM**	**6 Hours**
TMs with doubly infinite tapes, Multitape, Non-deterministic TM and universal TM.		
Text Books		
1. Introduction to languages & theory of computation - John C.Martin (MGH) 2. Formal Languages & Automata Theory - Basavraj S. Anami, Karibasappa K.G., Wiley Precise Textbook-Wiley India		
Reference Books		
1. Theory of Computation—Rajesh K Shukla (CENGAGE Learning) 2. Introduction to Automata theory, languages and computations – John E. Hopcraft, Rajeev Motwani, Jeffrey D. Ullman (Pearson Edition). 3. Discrete mathematical structures with applications to Computer science - J.P. Tremblay & R. Manohar (MGH) 4. Theory of Computer Science: Automata, Languages and Computation, Mishra, Phi 5. Theory of Computation, R B Patel & Prem Nath, Khanna Publications		

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(An Autonomous Institute)
Second Year B. Tech. (Artificial Intelligence and Machine Learning), Semester-IV

25AIU4CC2T -COMPUTER NETWORKS

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ESE**	60 Marks
Practical	2 Hours/week	**ISE**	40 Marks
Credits	3	**ICA**	25 Marks

Introduction:

This course introduces the fundamentals of Computer Networks. It also elaborates the layers of network architecture and communication protocols. The course includes implementation of socket programming and simulation of network protocols.

Course Prerequisite:

This course requires prior knowledge of any basic programming language.

Course Objectives:

1. To Introduce OSI reference model, TCP/IP protocol and different classes of IPv4 addressing.
2. To analyze client-server paradigm for socket interfaces and Transport layer protocols like TCP, UDP and SCTP.
3. To explore different application layer protocols like DHCP, DNS, FTP and TELNET.

Course Outcomes:

Student will be able to

1. Articulate the fundamentals of computer networks and layers of the OSI and TCP/IP reference models.
2. Compare various Data Link Layer protocols and apply error detection and correction techniques.
3. Apply the concepts of IP address for network set-up and implement the client-server paradigm using transport layer protocols.
4. Select and use appropriate Application Layer Protocols for a given problem.

Unit – I	**Introduction to Computer Networks and Reference Models**	**4 Hours**

Introduction to Computer Networks, Types of Computer Networks, Network Components, Reference models: OSI and TCP/IP.

Unit – II	**Data Link Layer**	**5 Hours**

DLL design issues, Error detection & correction, Sliding window protocols, Multiple access protocol: ALOHA, CSMA, CSMA/CD.

Unit – III	**Network Layer**	**6 Hours**

Introduction to IP Address, IPv4 Classful and Classless addressing, NAT, Routing algorithms: Shortest path routing, Flow-based routing, Distance Vector Routing.

Unit – IV	**Transport Layer**	**8 Hours**
UDP: Introduction, User Datagram, UDP Services, UDP Applications. **TCP:** TCP Services, TCP Features, Segment, TCP Connections. **Socket Interface:** Server, Client, Concurrency, Socket, Socket System Calls, Connectionless Iterative Server, Connection-oriented Concurrent Server.		
Unit – V	**Application Layer: Host Configuration and Remote Login**	**4 Hours**
Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS); File Transfer Protocol (FTP), TELNET, SSH.		
Unit – VI	**Application Layer: Electronic mail**	**3 Hours**
Email architecture, SMTP (Overview, Message Formats), IMAP, POP		

Internal Continuous Assessment (ICA):

1. Installation of Wireshark Tool on windows.
2. Write a program to simulate Go-Back-N and Selective Repeat Sliding Window protocols.
3. Simulation of CRC using C-Programming.
4. Configuration of Network-Assigning IP Address, Subnet-Mask, Default Gateway, DNS Server Addresses & Testing Basic Connectivity.
5. Connectionless Iterative Server: Implementation of Client-Server Programs Using Iterative UDP Server.
6. Connection-oriented Concurrent Server: Implementation of Client- Server Programs Using Concurrent TCP Server.
7. Implementation of Simple Network Chatting Application.
8. Implementation of Domain Name Space (DNS) protocol
9. Implement a packet sniffer to capture packets of a specified link layer, network layer, transport layer, or application layer protocol.
10. Design a given subnet using any simulator and demonstrate connectivity among all nodes as specified.
11. Critically analyze the WIT network design and suggest at least one improvement.

Text Books

1. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, fourth edition, Tata McGraw-Hill.
2. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, 4th/5th edition, 2017
3. AS Tanenbaum, “Computer Networks”, Pearson Education, ISBN 9788177581652
4. J.F. Kurose and K. W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson, ISBN-13: 9780201976991

Reference Books

1. Larry Peterson Bruce Davie, Computer Networks A Systems Approach, Elsevier, ISBN: 9780123850591
2. Kevin R. Fall, W. Richard Stevens, TCP/IP Illustrated, Volume 1: The Protocols, Pearson, ISBN-13: 978-0321336316/ISBN-10: 0321336313
3. Behrouz Forouzan, Data Communications and Networking, Tata McGraw-Hill, ISBN-13: 978-0073250328/ISBN-10: 0073250325
4. William Stallings, "Data and computer Communication", Pearson Education, ISBN-81-297- 0206-1
5. Alberto Leon Garcia and Indra Widjaja, "Communication Networks, Fundamental Concepts and Key Architectures", Tata McGraw-Hill, ISBN-10: 007246352X
6. Peter Loshin, IPv6 Theory, Protocol, and Practice, Elsevier, ISBN:9781558608108

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-IV

25AIU4CC3T -MACHINE LEARNING

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ESE**	60 Marks
Practical	2 Hours/week	**ISE**	40 Marks
Credits	4	**ICA**	25 Marks
		POE	25 Marks

Introduction:

This course introduces Machine Learning which deals with fundamentals of machine learning and its types. The course also introduces how to validate and evaluate the performance of machine learning models.

Course Prerequisite:

Prior knowledge of data structure and programming, Foundational Mathematics.

Course Objectives:

1. To understand the types of machine learning and the model preparation for ML algorithms.
2. To study and apply classification and regression models by selecting appropriate supervised learning algorithms for a given problem.
3. To study and apply clustering and association rule mining techniques by selecting appropriate unsupervised learning algorithms for a given problem.
4. To study methods to validate, evaluate and tune previously designed machine learning models.

Course Outcomes:

At the end of the course students will be able to
1. Understand the types of Machine learning and data preparation for model building
2. Apply classification and regression models by selecting appropriate machine learning algorithms for given problems.
3. Apply unsupervised learning techniques for data clustering and analysis.
4. Evaluate and optimize the performance of machine learning models using validation techniques, evaluation metrics, and hyper parameter tuning.

Unit – I	**Introduction to Machine Learning**	**5 Hours**

Introduction to Machine Learning, How do machines learn? Steps in Machine learning tasks. Types of Machine Learning: Supervised learning, unsupervised learning, Reinforcement learning, Comparison – supervised, unsupervised and reinforcement learning , Applications of Machine Learning.

Unit – II	**Data Preparation for Model Building**	**6 Hours**

Types of data, Exploratory Data analysis, Data preprocessing: Handling outliers, missing values, data mismatch errors, Data Transformation, data scaling and normalization, Feature Engineering, Data encoding techniques for categorical values.

Unit – III	Supervised Learning	10 Hours
Classification: Introduction, Examples of Supervised Learning, Classification model, Classification learning steps, Common classification algorithms- k-Nearest Neighbors (k-NN), Naïve Bayes classifier: Types of Naïve Bayes classifier Handling continues numeric features in Bayes classifier. Support vector machine Decision tree, Ensemble Methods: Boosting and Bootstrapping, Random Forest. Regression: Introduction, Examples of regression, Common regression algorithms-Simple linear Regression, Multiple linear regressions, Assumptions in regression analysis, Main problems in Regression analysis, Improving accuracy of the linear regression model, polynomial regression Model, logistic regression model.		
Unit – IV	**Unsupervised Learning**	**8 Hours**
Introduction to unsupervised learning, Working of unsupervised learning, Clustering: Clustering as a Machine learning task, different types of clustering techniques, Partitioning methods, k-means algorithm, k-medoids, Hierarchical clustering, Association rules mining: Apriori algorithm.		
Unit – V	**Validating Machine Learning Models**	**6 Hours**
Introduction: Bias, Variance, Underfitting, Overfitting, cost function, types of cost function, cross validation, Types of cross validation Training, Testing, Validation.		
Unit – VI	**Modeling and Evaluation**	**6 Hours**
Introduction, selecting a Model, training a Model, Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model.		
Text Books		
1. Machine Learning - Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson Publication. 2. Machine Learning for Dummies by John Paul Mueller, Luca Massaron (Published by For Dummies; First edition).		
Reference Books		
1. Machine Learning by Tom M. Mitchell (Publisher: McGraw Hill Education; First edition + New Chapters from Second edition). 2. Introduction to Machine Learning (Second Edition) by Ethem Alpaydın (published by The MIT Press Cambridge, Massachusetts London, England 3. Machine Learning with Python for Everyone by Mark E. Fenner, Pearson Publication		
Internal Continuous Assessment (ICA):		
Minimum 8 assignments requiring students to develop machine learning applications for real world problem/use-case/scenario based on any of the following topics		

1. Linear and Multilinear Regression
2. Decision Tree regressor
3. K-Nearest Neighbour (KNN) classifier
4. Logistic Regression classifier
5. Support vector machine (SVM)
6. Decision Tree classifier
7. Naive-Bayes classifier
8. Ensemble Models
9. K-means clustering (Unsupervised Learning)
10. Improving Machine Learning models using cross-validation and Hyper parameters tunning

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-IV

25AIU4EM4T -PROJECT MANAGEMENT

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ESE**	60 Marks
Credits	2	**ISE**	40 Marks

Course Objectives:

1. To introduce students to the comprehensive structure and lifecycle of project management, emphasizing the importance of scope definition and planning.
2. To develop the ability to evaluate and apply various project selection methods in alignment with organizational goals.
3. To provide an understanding of project control mechanisms and equip students with techniques for effective monitoring and controlling of project performance.
4. To build foundational knowledge of project initiation, including early-stage planning, stakeholder identification, and resource estimation.

Course Outcomes:

Students will be able to

1. Discuss complete structure of project management and analyze the scope of project planning.
2. Identify different project selection methods.
3. Define the guidelines required for project control and its controlling techniques.
4. Outline the basic idea of projects and its initial management.

Unit – I	**Project Initiation**	**7 Hours**

Introduction to project management, Agile project management, Project Selection Models, Examples of Project Selection Models, Project manager, Attributes of Effective Project Manager, managing for stakeholders, Resolving Conflicts, Negotiation, Project in the organization structure, Human factors and the project team

Unit – II	**Project Planning**	**9 Hours**

Traditional project activity planning, Agile project planning, Project charter, Coordination through integration management, Project feasibility analysis, Estimating project budgets, Project risk management, Quantitative risk assessment methodologies, Critical path method (CPM), Programme evaluation and review technique (PERT), Risk analysis with simulation for scheduling, Gantt Chart, Scheduling with scrum, Crashing a project, Resource loading, Resource leveling, Goldratt's critical chain

Unit – III	**Project Execution**	**7 Hours**

Planning-monitoring-controlling cycle, Earned value analysis, Agile tools for tracking project, Three types of project-controlling, Control of change scope and scope creep, Project audit, Essentials of an audit/evaluation, When to close a project, Benefits realization, Case study on the success of Chandrayan-3

Unit – IV	IT for Project Management	7 Hours
Software for project management, Demo on project management software, Simulations software for project management.		
Reference Books		
1. Project Management (A Strategic Managerial Approach) by Meredith 2. Essentials of Project Managemnt, Kamaraju Ramakrishna, PHI Learning, New Delhi, 2010 3. Project Management, Harold Kerzer, Wiley, New York 4. Projects – Planning, analysis, selection, implementation and review, Tata McGraw-Hill, New Delhi, 2010		

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-IV

25CMU4AE7T -GENERAL PROFICIENCY

Teaching Scheme		**Examination Scheme**	
Lectures	1 Hour/week	**ICA**	50 Marks
Tutorials	1 Hour/week		
Credits	2		

Introduction

In today's global and competitive professional environment, engineers need more than just technical knowledge to succeed—they must also demonstrate strong communication, problem-solving, interpersonal, and leadership skills. The General Proficiency course has been carefully designed to help students transition smoothly from academia to industry by nurturing holistic development. Through a series of structured, experiential modules, this course sharpens students' employability skills, fosters responsible citizenship, and encourages physical and emotional well-being. It focuses on essential areas such as professional communication, aptitude training, soft skills, and social engagement-ensuring students are better prepared for placements and life beyond college.

Course Prerequisite:

The students need to have basic knowledge of communication language- oral and writing skill.

Course Objectives:

1. Teach students to create ATS-friendly, job-specific resumes and write professional emails using standard formats.
2. Help students participate effectively in group discussions by using clear communication, good body language, and time management.
3. Prepare students for interviews by improving self-introductions, nonverbal cues, and strategies for answering questions confidently.
4. Show students how to format and write clear notices, agendas, and meeting minutes with the right tone and language.
5. Raise students' awareness of different personality types and the importance of grooming, body language, time management, and professional etiquette.

Course Outcomes:

At the end of this course, the student will be able to

1. Create job-specific, ATS-friendly resumes and write professional emails.
2. Contribute to group discussions using effective communication techniques.
3. Face an interview with confidence by applying personal interview techniques.
4. Write clear and well-structured notices and meeting of minutes following professional standards.
5. Identify personality types, maintain proper grooming & body language and manage time well.

Unit – I	**Professional Communication**	**4 Hours**

ATS friendly Resume preparation, Resume according to Job description, Tips to make an effective resume, Do's and Don'ts of Professional Email Writing

Unit – II	**Group Discussion (GD) Skills**	**4 Hours**
Role of Group Discussion in selection process, Tips for effective GD participation, Dos and Don'ts of effective group participation. Body language and time management in Group Discussion.		
Unit – III	**Personal Interview Techniques**	**2 Hours**
Self Introduction, Non-verbal communication: posture, power dressing, eye contact, tone, Common interview questions and strategies for answering them, Handling difficult or unexpected questions.		
Unit – IV	**Notices, Agendas, and Minutes of Meeting**	**2 Hours**
Writing Notices, Format and layout, Language and tone, Sample notices for meetings, events, seminars, etc. Guidelines for effective 'minutes of meeting' writing, Do's and Don'ts of Minutes of Meeting		
Unit – V	**Personality Development for Engineering Students**	**2 Hours**
Types of personalities and dealing with them, Personality traits, Personal grooming & Body Language for Success, Personality depiction, Time Management & Discipline, Professional Etiquettes		

Internal Continuous Assessment (ICA) :

Minimum 10 assignments from the below mentioned list

1. **Resume Creation**: Students will prepare a one-page ATS friendly resume tailored to their Job description
2. **Email and Letter Writing**: Each student will draft a formal email and a cover letter intended for a job application
3. **Notice, Agenda and Minutes of Meeting Writing**:Write the Notice, agenda and Minutes of Meeting in a business setting
4. **Public Speaking:** Just a Minute & Elevator pitch activities.
5. **Self-Grooming Journal**: Students will maintain a grooming and time-management journal for three consecutive days, documenting habits, self-discipline practices, and areas of improvement.
6. **SWOT Analysis of Personality:** Each student will perform a personal SWOT analysis to identify their strengths, weaknesses, opportunities, and threats in the context of personality development and employability.
7. **Mock Group Discussion**: Students will participate in mock GDs on current topics and after GD, performance of participants will be reviewed by peer assessment method
8. **Mock Personal Interviews**: Students will undergo mock HR, simulations in front of peers and instructors, followed by personalized feedback on performance and body language.
9. **Body Language:** Record the responses of students during the interview and instructor will analyse their body language and provide personalised feedback
10. **Grooming and Etiquette Demonstration**: In this session, students will observe and demonstrate proper grooming standards, professional dress code, and social etiquettes suitable for interviews and corporate environments.
11. **Time Management Activity**: Students will be preparing Vision Board activity where they have to set their long-term goal chronologically
12. **Leadership and Teamwork Exercise**: Solving and discussing Self and Business Case studies

Text Books

1. **Soft Skills: An Integrated Approach to Maximize Personality** – Gajendra Singh Chauhan & Sangeeta Sharma, Wiley India Pvt. Ltd.
2. **Communication Skills for Professionals** – Nira Konar, PHI Learning, 3rd Edition, 2022.
3. **On Writing Well** – William Zinsser, Harper Resource Book, 2001.
4. **Technical English** – Dr. M. Hemamalini, Wiley India Pvt. Ltd.
5. **Professional Speaking Skills** – Aruna Koneru, Paperback, January 2018.
6. **Group Discussion and Interview Skills** – Priyadarshi Patnaik, Cambridge University Press India, 2nd Edition, 2015.

Reference Books

1. **Soft Skills** – K. Alex, S. Chand Publications.
2. **Soft Skills: A Textbook for Undergraduates** – Ajay R. Tengse, Orient BlackSwan.
3. **Communication Skills** – Sanjay Kumar & Pushpa Lata, Oxford University Press.
4. **Managing Soft Skills for Personality Development** – B. N. Ghosh, McGraw Hill.
5. **Soft Skills for Everyone** – Jeff Butterfield, Cengage Learning.
6. **Soft Skills for Managers** – Dr. T. Kalyana Chakravarthi & Dr. T. Latha Chakravarthi, Biztantra Publication.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-IV

25CMU4VE8T -PROFESSIONAL ETHICS

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hours/week	**ISE**	50 Marks
Credits	2		

Introduction

This course is designed to explore the principles and standards of moral and ethical conduct in professional settings. This course aims to equip students with the necessary tools to navigate complex ethical dilemmas and make informed decisions that uphold the integrity and ethical standards of their profession. It emphasizes the importance of ethical behavior in building trust, maintaining credibility, and fostering a positive professional environment.

Course Objectives:

1. To make student aware of Professional Ethics in engineering.
2. To make student aware of various theories in Professional Ethics.
3. To make student learn about safety, risk and responsibilities of an engineer.
4. To make student learn about the global issues in Professional Ethics.

Course Outcomes:

After completing this course, student will be able to
1. Follow Professional Ethics in his life.
2. Describe various theories in Professional Ethics.
3. Identify safety, risk and responsibilities of an engineer.
4. Behave consciously to global issues in Professional Ethics.

Unit – I	**Introduction to Professional Ethics**	**3 Hours**

Introduction, Engineering and Professionalism, Two models of Professionalism, Three types of morality, Preventive Ethics, Aspirational Ethics

Unit – II	**Engineering Ethics**	**4 Hours**

Senses of engineering ethics, Variety of Moral Issues, Types of Inquiry, Recent developments towards ethics in engineering, Moral Dilemmas-steps to solve moral dilemmas.

Unit – III	**Theories in Engineering Ethics**	**4 Hours**

Kohlberg's Theory, Gilligan's Theory, Consensus and Controversy, Models of Professional Roles, Theories about Right Action, Self interest, Customs and Religion, Uses of Ethical theories.

Unit – IV	**Engineering as Social Experimentation**	**3 Hours**

Engineering projects vs Standard projects, Engineers as responsible experimenters, code of ethics, Industrial standards.

Unit – V	**Safety and Risk**	**4 Hours**
Concept of safety, Engineers and safety, Risk- Types of accidents, Risk Benefit analysis, Reducing risk, Risk Management.		
Unit – VI	**Responsibilities of an Engineer**	**3 Hours**
Collegiality, Loyalty, Respect of Authority, Collective Bargaining, Confidentiality, Conflict of Interest.		
Unit – VII	**Rights of an Engineer**	**3 Hours**
Professional Rights, Employee Rights, Whistle Blowing, Intellectual Property Rights, Discrimination, Preferential Treatment.		
Unit – VIII	**Global Issues**	**4 Hours**
Multinational Corporation, Ways of promoting morally just measures, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Expert Witnesses and Advisors, Moral Leadership, Corporate Social Responsibility.		
Text Books		
1. R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006. 2. Professional Ethics: R. Subramanian, Oxford University Press, 2015. 3. Dr. N. Venkateswaran, Professional Ethics in Engineering, Sree Kamalamani Publications.		
Reference Books		
1. Charles E. Harris Jr., Michael S. Pritchard and Michael J. Rabins, Engineering Ethics:		

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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25AIU4CC9P -OOP using JAVA

Teaching Scheme		**Examination Scheme**	
Lectures	1 Hour/week	**ISE**	25 Marks
Practical	2 Hours/week	**ICA**	25 Marks
Credits	2	**POE**	50 Marks

Introduction:

The course introduces Java language's syntax and object-oriented programming paradigms from the perspective of Java language. Further, the course thoroughly touches upon the vital aspects of the usage of Java runtime library packages' classes and methods.

Course Objectives:

1. To introduce the basics of Object-Oriented Programming paradigm
2. To introduce the core components of Java programming language
3. To study Java APIs to write and debug applications using Java

Course Outcomes:

At the end of this course students will be able to
1. Implement Object Oriented Programming paradigm using Java language.
2. Design and implement Inheritance and interface concepts in Java.
3. Apply appropriate Exception handling mechanisms in java programs.
4. Exhibit the ability to use Java runtime library APIs to provide a solution to a given problem.

Unit – I	**Basics of Java and Strings in Java**	**2 Hours**

Building blocks of Java Language: Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input and Output, Data Types, Arrays, Type Casting. String, StringBuffer and String Bulder Classes in Java

Unit – II	**Classes, Objects and Package**	**3 Hours**

Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Abstract class, Wrapper classes.
Package: Use of Package and Access control.

Unit – III	**Inheritance and Interfaces**	**2 Hours**

Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding, handling multilevel constructors –super keyword, final keywords. Creation and Implementation of an interface.

Unit – IV	**Exceptions and Error Handling**	**2 Hours**

Exceptions and Errors, Catching and Handling Exceptions, Chained Exceptions, Custom Exceptions.

Unit – V	I/O Programming	2 Hours
Basic I/O: I/O Streams, Byte Streams, Character Streams, Buffered Streams, Data Streams, Object Streams, File Operations.		
Unit – VI	**Java Collections Framework and Multithreading**	**4 Hours**
Introduction to collections, The Comparable and Comparator Interfaces, Sorting using Comparable & Comparator. Collections: Lists, Sets, Maps, Trees, Iterator and Collections Class. **Multithreading:** Creating Threads, Thread scheduling and priority, Thread interruptions and synchronization.		
ISE Evaluation:		
ISE Evaluation for the course will consist of three programming (hands-on) tests.		
Internal Continuous Assessment (ICA): ● ICA shall consist of minimum 10 practical assignments based on following list: 1. Basics of Java 2. String class in Java 3. StringBuffer and StringBuilder classes in Java 4. Classes and Objects in Java 5. Constructor and Method Overloading 6. Packages in Java 7. Inheritance and its types 8. Method Overriding 9. Interfaces in Java 10. Exceptions and Error Handling 11. I/O Programming 12. File Handling 13. Java Collection Framework 14. Multithreading ● The assignments should test and develop student's practical proficiency and ability to use Java API Classes correctly for writing code for varied applications scenarios & use case requirements. ● Use of IDEs like BlueJ, Eclipse, Netbeans or any other FOSS alternative for Interactive development and debugging of Java applications is highly recommended to enhance hands-on skills in Java Programming of Students.		
Text Books		
1. Head First Java, Kathy Sierra, Bert Bates, O'Reilly Publication 2. The JavaTM Programming Language, Ken Arnold, James Gosling, David Holmes, Pearson Publication 3. Core Java for Beginners, Rashmi Kanta Das, Vikas Publishing House Pvt. Ltd. 4. Programming with Java, Balaguruswamy, TMH 5. Internet and Java Programming, Tanweer Alam, Khanna Publishing House		
Reference Books		
1. The Java Language Specification, Java SE 8 Edition Book by James Gosling, Oracle Inc. 2. Java: The Complete Reference 8 Edition - Herbert Schildt, Tata McGraw – Hill Education 3. The JavaTM Tutorials. Oracle Inc.		
e-resources:		
1. http://docs.oracle.com/javase/specs/ 2. http://docs.oracle.com/javase/tutorial/		

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Artificial Intelligence and Machine Learning), Semester-IV

25CMU4VE2T -UI/UX Design (Web)

Teaching Scheme		**Examination Scheme**	
Lectures	1 Hour/week	**ICA**	25 Marks
Practical	2 Hours/week	**ISE**	25 Marks
Credits	2		

Introduction:

This course introduces students to User Interface (UI) and User Experience (UX) design principles with a focus on web technologies. The course emphasizes human-centered design, usability, accessibility, and responsive web interfaces, enabling AI/ML students to design intuitive front-end systems for intelligent applications.

Course Pre-requisite:

Knowledge of programming paradigms and object-oriented programming principles.

Course Objectives:

After successful completion of the course, students will be able to:

1. Understand the fundamentals of UI/UX design and its importance in modern web and AI-driven applications.
2. Apply human-cantered design principles to develop usable and accessible web interfaces.
3. Design wireframes, prototypes, and responsive layouts using modern web technologies.
4. Implement UI designs using HTML5, CSS3, and basic JavaScript.
5. Evaluate and improve user experience using usability testing and heuristics.

Course Outcomes:

Upon completion of the course, the student will be able to:

CO1. Explain fundamental concepts of UI/UX design, human–computer interaction, and usability principles applicable to web-based systems.

CO2. Design and prototype user-centric, accessible, and responsive web interfaces using established UX methodologies and design tools.

CO3. Implement and evaluate

interactive web interfaces using HTML5, CSS3, basic JavaScript, and usability testing techniques.

Unit – I	**Introduction to UI/UX & Web Design**	**3 Hours**

UI vs UX: Definitions and scope. Importance of UI/UX in AI-enabled applications
Basics of Human–Computer Interaction (HCI). Design thinking process. Overview of modern web technologies

Unit – II	**UX Research & Information Architecture**	**3 Hours**
User personas and user journeys. User requirements and task analysis. Information architecture. Navigation design. Accessibility standards (WCAG basics)		
Unit – III	**UI Design Principles & Visual Design**	**3 Hours**
Layout principles and grid systems. Typography and color theory. Consistency, feedback, affordance. Responsive design principles. UI patterns for web applications		
Unit – IV	**Web Technology for UI Development**	**4 Hours**
HTML5 semantic elements. CSS3. Introduction to responsive frameworks (Bootstrap) JavaScript for UI interactions. Form design and validation		
Unit – V	**Prototyping, Testing & Evaluation**	**2 Hours**
Wireframing and prototyping tools (Figma / Adobe XD / Any other tools). Low-fidelity vs high-fidelity prototypes. Usability testing methods. Heuristic evaluation. UX metrics and feedback integration		

Practical Syllabus Students shall perform **minimum 8 - 10 practical's**, including:

1. Study of good and bad UI/UX examples
2. Creating user personas and user journeys
3. Designing wireframes for a web application
4. Creating low-fidelity and high-fidelity prototypes
5. Designing responsive layouts using HTML & CSS
6. Implementing navigation menus and forms
7. Applying CSS media queries for responsiveness
8. Basic JavaScript for UI interaction
9. Conducting usability testing and reporting results
10. **Mini Project:** Design and develop a user-centric web interface (individual or group)

NOTE: All assignments must be application based.

Internal Continuous Assessment (25 Marks)

- Assignments / Quizzes: 10 Marks
- Practical performance & record: 10 Marks
- Mini Project / Case Study: 5 Marks

Tools & Technologies

- HTML5, CSS3, JavaScript
- Bootstrap
- Figma / Adobe XD / Any other tools
- Browser Developer Tools

Reference Books
1. Steve Krug, Don’t Make Me Think, New Riders 2. Alan Cooper et al., About Face: The Essentials of Interaction Design 3. Jesse James Garrett, The Elements of User Experience 4. Jon Duckett, HTML & CSS: Design and Build Websites 5. Ben Frain, Responsive Web Design with HTML5 and CSS

Artificial Intelligence & Machine Learning

B. Tech. Semester V

Group	Course Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
			L	T	P		Theory	OE/ POE	ISE	ICA	
		Design and Analysis of Algorithm	2	--	--	2	60	--	40	--	100
		Operating Systems	3	--	--	3	60	--	40	--	100
		Data Analysis and Visualization	3	--	--	3	60	--	40	--	100
		Programme Elective I	3	--	--	3	60	--	40	--	100
		Indian Knowledge System-II: Vedic Mathematics	2	--	--	2	--	--	50	--	50
		Multidisciplinary Minor III	3	--	--	3	60	--	40	--	100
		Open Elective III (MOOC)	--	--	--	2		--	–	50	50
		Subtotal	**16**	**--**		**18**	**300**	**--**	**250**	**50**	**600**
Laboratory Courses											
		Design and Analysis of Algorithm	--	--	2	1	--	--	25	25	50
		Data Analysis and Visualization	--	--	2	1	--	--	--	25	25
		Programme Elective I	--	--	2	1	--	--	--	25	25
		Full Stack Development	2	--	2	1	--	50	25	25	100
		Subtotal	**--**	**--**	**08**	**4**	**--**	**50**	**50**	**100**	**200**
		Grand Total	**18**	**--**	**08**	**22**	**300**	**50**	**300**	**150**	**800**

Note:

- N*indicates the serial number of electives offered in the respective category
- ##indicates program code of offering Programme

Artificial Intelligence & Machine Learning

B. Tech. Semester VI

Group	Course Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
			L	T	P		Theory	POE	ISE	ICA	
		Natural Language Processing	3	--	--	3	60	--	40	--	100
		Database Management System	3	--	--	3	60	--	40	--	100
		Software Engineering	3	--	--	3	60	--	40	--	100
		Programme Elective-II	3	--	--	3	60	--	40	--	100
		Programme Elective -III	2	--	--	2	--	--	50	--	50
		Multidisciplinary Minor IV	2	--	--	2	60	--	40	--	100
		Subtotal	16	--		16	300	--	250	--	550
Laboratory Courses											
		Database Management System	--	--	2	1	--	–	--	25	25
		Programme Elective-II	--	--	2	1	--		--	25	25
		Advanced Java Programming	2	--	2	3	--	50	25	25	100
		Multidisciplinary Minor IV	--	--	2	1	--		--	25	25
		Subtotal	2	--	08	**6**	**--**	**50**	**25**	**100**	**175**
		Grand Total	**18**	**--**	**10**	**22**	**300**	**50**	**275**	**100**	**725**

Note:

- N* indicates the serial number of electives offered in the respective category
- ## indicates program code of offering Program

List of Programme Elective-I

Course Code	Name of Course
	Data Science
	Prompt Engineering
	Pattern Recognition

List of Programme Elective-II

Course Code	Name of the Course
	Reinforcement Learning
	Big Data
	Image Processing

List of Programme Elective-III

Course Code	Name of the Course
	Business Intelligence
	Internet of Things
	Computer Vision Robotics

Artificial Intelligence & Machine Learning

B. Tech. Semester VII

Group	Course Code	Name of Course	Engagement Hours			Credits	FA		SA		Total
			L	T	P		ESE	POE	ISE	ICA	
		Deep Learning	3	--	--	3	60	--	40	--	100
		Web Analytics	3		--	3	60	--	40		100
		Quantum Computing	3	--	--	3	60	--	40	--	100
		Professional Elective-I	3	--	--	3	60	--	40	--	100
		Professional Elective-II	3	--	--	3	60	--	40	--	100
		Sub Total	**15**	**--**	**--**	**15**	**300**	**--**	**200**		**500**
Laboratory Courses											
		Full Stack Development	2	-	2	3	--	50	25	25	100
		Deep Learning	--	--	2	1	--	--		25	25
		Web Analytics	--	--	2	1	--	--	--	25	25
		Professional Elective-II	--	--	2	1	--	--	--	25	25
		Project Phase-I	--		4	2	--	50		50	100
		Vocational Training	--	-	--	2	--	--	--	50	50
		Subtotal		**--**	**10**	**10**	**--**	**100**	**-**	**200**	**325**
		Grand Total	**15**		**10**	**25**	**300**	**100**	**225**	**200**	**825**

Artificial Intelligence & Machine Learning

B. Tech. Semester VIII

Group	Course Code	Name of Course	Engagement Hours			Credits	FA		SA		Total
			L	T	P		ESE	OE/POE	ISE	ICA	
	Laboratory Courses										
		Project Phase II	--	--	4*	2	--	50	--	50	100
		Internship II/On Job Training (OJT)	--	--	20*	10	--	100	--	100	200
		MOOC									
		Total	--	--	24	**12**	--	**150**	--	**150**	**300**

Note:

- N*indicatestheserialnumberofelectivesofferedintherespectivecategory
- ##indicatesprogram codeofofferingProgramme

Professional Elective I

Course Code	Name of Course
	Devops
	Cyber Security Blockchain
	Data Warehousing &Mining

Professional Elective II

Course Code	Name of Course
	Generative Artificial Intelligence
	Predective Analytics
	Cloud Computing