



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
MDM offered by Department of Information
Technology

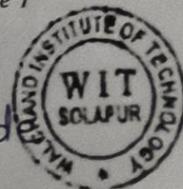
For S. Y. B.Tech. & T.Y. B.Tech.

W.E.F. 2025-26

S. S. S.
HEAD
Information Technology Deptt.
W.I.T., Solapur.



Manish
Dr. Mrs. M. A. Nirgud
Dean Academics



Department of Information Technology

Vision

- To be a frontier in Information Technology, to produce globally competent engineers with an aptitude for leadership and research, who will be instrumental in continuous socio-economic development.

Mission

- **M1:** To impart quality education in Information Technology in accordance with the needs of the society through blended mode.
- **M2:** To inculcate critical thinking and creativity for identifying various issues and to provide sustainable solutions by becoming a lifelong learner.
- **M3:** To enhance career opportunities through academia-industry interaction and research, while embodying professional ethics.



Department of Information Technology

Program Educational Objectives (PEOs)

- Graduates will exhibit strong fundamental knowledge and skills in the field of Information Technology to pursue successful professional careers, higher studies and research.
- Graduates will exhibit capabilities to understand and resolve the various issues through their problem-solving skills.
- Graduates will be sensitive to ethical, societal and environmental issues while serving at their professional work and society.

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. Students will be able to apply fundamentals of mathematics, algorithms and computational systems to Information technology.
2. Students will be able to provide a solution to the problem in the areas of Networking, Database management, System Software, Web Technology, Information Security and Thrust areas.
1. Students will be able to design and develop IT solution for societal problem/s while encouraging usage of Free and Open-Source Software (FOSS).



MDM offered by Department of Information Technology

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



MDM offered by Department of Information Technology

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./ Year 1/2/3/...8	Course Type		Course Serial No 1-9	Theory, L- Lab session P- Programming

Program Code	
IT	Information Technology
Course Type	
BS	Basic Science
ES	Engineering Science
HU	Humanities & Social Science
MC	Mandatory Course
CC	Core Compulsory Course
SN*	Self-Learning <i>N* indicates the serial number of electives offered in the respective category</i>
EN*	Core Elective <i>N* indicates the serial number of electives offered in the respective category</i>
ON*	Open Elective <i>N* indicates the serial number of electives offered in the respective category</i>
SK	Skill Based Course
SM	Seminar
MP	Mini project



PR	Project
IN	Internship

Sample Course Code	
23ITU3CC1T	Discrete Mathematics Structures



MDM offered by Department of Information Technology

B. Tech. Semester III

Semester	Course Code	Name of Course	Engagement Hours			Credits	FA		SA		Total
			L	T	P		Theory	OE/POE	ISE	ICA	
III	24ITU3MD6T	Multidisciplinary Minor I Principles of Operating Systems	2	-	-	2	60	-	40	-	100
IV	24ITU4MD6T	Multidisciplinary Minor II Web UI and UX Technology	1	-	-	1	-	-	50	-	50
V	23ITU5MD6T	Multidisciplinary Minor - III	3	-	-	3	60	-	40	-	100
VI	23ITU6MD6T	Multidisciplinary Minor - IV	2	-	2	3	60	-	40	25	125
		Subtotal	8	-	2	9	180	-	170	25	375
Laboratory Courses											
							ESE				
							POE	OE			
IV	24ITU4MD6L	Multidisciplinary Minor II Web UI and UX Technology Lab	-	-	2	1	-	-	-	25	25
		Subtotal	-	-	2	1	-	-	-	25	25
		Grand Total	8	-	6	11	180	-	170	75	425

*Examination will be MCQ based.

Note:

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





WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. Semester-III

24ITU3MD6T: PRINCIPLES OF OPERATING SYSTEMS

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

Introduction:

This course introduces Fundamentals and basic knowledge of an operating system. It also covers the details Process Management, deadlock, Memory Management, Unix System commands, and Introduction to Shell programming.

Course Prerequisite:

Students should have knowledge of Computer Systems and basics of C programming language.

Course Objectives:

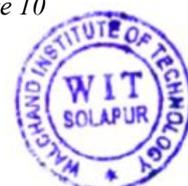
1. To introduce students to various data structures.
2. To develop programming skills to implement and analyze linear and nonlinear data structures
3. To identify and apply the suitable data structure for problem-solving.

Course Outcomes:

After completing the course, students will be able to

1. Outline various concepts and features of Operating systems, Linux commands and shell scripts
2. Demonstrate the knowledge of process scheduling algorithm.
3. Analyze the memory management and its allocation policies for CPU performance.
4. Compare and contrast the functionality of file systems.

Unit – I	Introduction	7 Hours
Operating system definition, Simple Batch System, Multi programmed Batch System, Time Sharing System, Personal Computer System, Parallel System, Real Time System, and System Calls. Basic Linux Commands, Shell Script.		
Unit – II	Process	8 Hours
Process Concept, Process Scheduling, and Operations on processes, Cooperating Processes, Threads, Scheduling Criteria, and Scheduling Algorithms		
Unit – III	Memory Management	8 Hours



Background, Logical Versus Physical Address space, Swapping, Contiguous Allocation, Paging, Segmentation.		
Unit – IV	File System	7 Hours
Background, Demand paging, Page replacement, Page replacement algorithms.		
Internal Continuous Assessment (ICA): In tutorial session, students of different batches should be assigned exercise problems and should be guided for the solution. Minimum one tutorial per unit is expected.		
Text Books		
<ol style="list-style-type: none"> 1. Operating System concepts, Silberschatz, Galvin, 7th or 8th Edition (John Wiley). 2. Introduction to Unix Shell Programming, M.G. Venkateshmurthy 		
Reference Books		
<ol style="list-style-type: none"> 1. Operating Systems: Design and Implementation, Andrew S. Tanenbaum, Albert S. Woodhull Pearson Prentice Hall 2. Operating Systems: Internals and Design Principles, William Stallings, Pearson 		





WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. Semester- IV

24ITU4MD6T: WEB UI AND UX TECHNOLOGY

Teaching Scheme		Examination Scheme	
Lectures	1 Hours/week	ESE	-
Practical	2 Hours/week	ISE	50 Marks
Credits	2	ICA	25 Marks

Introduction:

Web Technology alludes to the different tools and techniques that are used during the process of communication between various sorts of gadgets over the web or internet. This course includes different technologies which help to build front end and back end for websites and web applications.

Course Prerequisite:

For the WEB UI AND UX TECHNOLOGY course, there are generally no strict prerequisites in terms of prior education or specific skills. While some courses might prefer or recommend certain backgrounds, the field is generally open to individuals from various academic and professional paths.

Course Objectives:

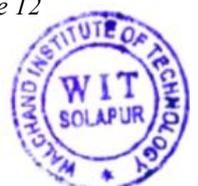
1. Inculcate skills necessary to design, develop and style a web-based user interface
2. Develop ability to identify appropriate client/server-side scripting web technologies suitable for a given use case.
3. Develop skills required to create light weight, efficient and scalable browser-based APIs web applications

Course Outcomes:

After completing the course, students will be able to

1. Design web pages using HTML, CSS and JavaScript
2. Analyze client/server-side scripting technologies to meet requirements of web application and choose an appropriate one
3. Develop a dynamic website using PHP
4. Develop web application using client/server-side scripting technologies for a given problem.

Unit – I	Introduction to Web Technology	2 Hours
History and Evolution of the Web, How the Internet Works, Understanding Web Servers and Clients.		
Unit – II	HTML5	3 Hours
HTML Basics and Structure, Semantic Elements in HTML5, Forms and Input Types, Multimedia: Audio, Video, Canvas.		



Unit – III	CSS3	3 Hours
CSS Basics and Syntax, Selectors and Specificity, Box Model and Layout Techniques, Flexbox and Grid Layout, Animations and Transitions.		
Unit – IV	JavaScript	4 Hours
JavaScript Basics Introduction to JavaScript, Variables, Data Types, and Operators, Control Structures (Loops, Conditionals), Functions and Scope		
Unit – V	PHP and MySQL	3 Hours
Introduction to PHP 5 and PHP 6, variables and constants, program flow, functions, arrays and files and directories, , Forms and Databases, ,integration with MySQL applications on PHP.		
Internal Continuous Assessment (ICA):		
<ol style="list-style-type: none"> 1. Minimum 10 assignments based on above topics. 2. Objective of assignments should be to test students' understanding and assess their ability to put into practice the concepts and terminologies learned. 3. Assignments must be of nature, which require students to identify the use case scenarios for using technologies mentioned in the syllabus. 		
Text Books		
<ol style="list-style-type: none"> 1. Ben Frain, Responsive Web Design with HTML5 and CSS3 , Packt Publication 2. Jon Duckett, —JavaScript and jQuery: Interactive Front-End Web Development 		
Reference Books		
<ol style="list-style-type: none"> 1. Official documentation of OpenAPI standardhttp://spec.openapis.org/oas/v3.0.3 2. Official documentation of PHPhttps://www.php.net/docs.php 		





WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Third Year B.Tech. Semester-V

Multidisciplinary Minor - III
23ITU5MD6T: Software Engineering Principles

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/week	ESE	60 Marks
Practical	-	ISE	40 Marks
Credits	3	ICA	-
		OE/POE	-

Introduction:

Software engineering integrates engineering principles and computer science concepts to develop reliable, usable and dependable software. This course introduces essential software engineering concepts and methodologies, aligned with the software development life cycle. This course equips students with skills to address real-world software engineering challenges.

Course Prerequisite:

Fundamental knowledge of programming principles is required.

Course Objectives:

1. Analyse various software development lifecycle models and apply the most suitable model for a given project.
2. Prepare Software Requirements Specification (SRS) and Software Design Specification (SDS) documents for a given problem.
3. Apply appropriate testing methods.
4. Emphasize quality management throughout the software development process.

Course Outcomes:

After completing the course, students will be able to

1. Select and apply the appropriate lifecycle model for software development.
2. Prepare SRS and SDS accordingly for a given problem.
3. Select and apply appropriate software testing methods.
4. Ensure the quality of a product by applying the quality management process.

Unit – I	Introduction to Software Engineering	10 Hours
Introduction, Software Engineering Challenges and Approach, Software Process, Characteristics of Software Process, Software Development Process Models: Waterfall Model, Prototyping Model, Iterative Development Model: Incremental Model, Spiral Model, Time Boxing Model, Agile Process Model.		
Unit – II	Software Requirement Analysis & Specification	9 Hours



Need for SRS, Characteristics of Good SRS, Requirement Process, Requirements Specification, Functional Specification with Use Cases, Other Approaches for Analysis: Data Flow Diagram (DFD), Entity Relationship Diagram (ERD).		
Unit – III	Software Architecture and Design	13 Hours
Introduction to Software Design, Software Architecture: Role of Software Architecture, Architecture Views, Component & Connector View, Architecture Style for Component & Connector View, Documenting Architecture Design, Function-Oriented Design: Design Principles, Module Level Concepts, Design Notation and Specification, Structured Design Methodology, Object-Oriented Design: Analysis and Design, OO Concepts, Design Concepts.		
Unit – IV	Testing	5 Hours
Testing Fundamentals, Testing Process, Black-Box Testing, White-Box Testing, Object-Oriented Software Testing Methods, Functional Testing, Unit Testing, System Testing, User Satisfaction Testing.		
Unit – V	Project Planning and Management	8 Hours
Project Management Process, The Inspection and Audit Process, Software Configuration Management Process, Effort Estimation, Project Schedule and Staffing, Quality Planning: Quality Concepts, Qualitative Quality Management Planning, CMM Project Management Process, Risk Management Planning, Project Monitoring Plan, Detailed Scheduling.		
Text Books		
1. An Integrated Approach to Software Engineering - 3 rd edition: Pankaj Jalote (Narosa Publishers)		
Reference Books		
1. Ian Sommerville, Software Engineering - Pearson Education Asia, 6th edition 2. Software Engineering Fundamentals - Ali Behforooz and Frederick J. Hudson (Oxford University Press) 3. Project Management with Scrum - Ken Schwaber		





WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Third Year B.Tech. Semester-VI

Multidisciplinary Minor IV
23ITU6MD6T: Data Pre-Processing and Visualization

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

Introduction:

Data science is a field of study and application that has been growing rapidly for the past several decades. As a growing field, it is gaining a lot of attention in both the media as well as in the job market. This course will introduce students to data pre-processing and visualization techniques and tools.

Course Prerequisite:

Fundamentals of Python Programming

Course Objectives:

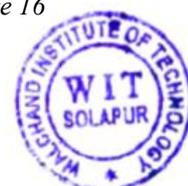
1. To equip students with skills to prepare and clean datasets effectively, including handling missing data, transforming variables, and creating structured tables for analysis.
2. To develop proficiency in using NumPy for efficient numerical computation and data manipulation, emphasizing array operations, broadcasting, and aggregation techniques.
3. To build expertise in manipulating, analysing, and merging datasets using Pandas, and working with complex data structures such as hierarchical indexes and time series.
4. To cultivate the ability to design, implement, and customize a variety of data visualizations using Matplotlib, Seaborn, and other Python libraries, including handling spatial and dynamic data visualizations.

Course Outcomes:

After completing the course, students will be able to

1. Understand the role and functionality of different data science tools.
2. Perform data manipulation and visualization using Python, R, and SQL.
3. Work with Big Data tools such as Hadoop, Spark, and cloud platforms.
4. Develop and deploy machine learning models using industry-standard tools

Unit – I	Introduction and Preparing Data Tables	08 Hours
Overview, Cleaning the Data, Removing Observations and Variables, Generating Consistent Scales Across Variables, New Frequency Distribution, Converting Text to Numbers, Converting Continuous Data to Categories, Combining Variables, Generating Groups, Preparing Unstructured, Data Visualizing Relationships between Variables, Calculating Metrics about Relationships.		
Unit – II	Introduction to NumPy	07 Hours



Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything in Between, Computation on Arrays: Broadcasting, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data: NumPys Structured Arrays 12.		
Unit – III	Data Manipulation with Pandas	07 Hours
Installing and Using Pandas, Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append, Combining Datasets: Merge and Join, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas.		
Unit – IV	Data Visualization	06 Hours
Overview, Visualization Design Principles, Tables, Univariate Data Visualization, Multivariate Data Visualization, Visualizing Groups, Dynamic Techniques.		
Unit – V	Visualization with Matplotlib and Seaborn	09 Hours
General Matplotlib Tips, Two Interfaces for the Price of One, Simple Line Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends, Customizing Colorbars, Multiple Subplots, Text and Annotation, Customizing Matplotlib: Configurations and Stylesheets, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Introduction to Seaborn: Seaborn functionalities and usage, Spatial Visualizations and Analysis in Python with Folium, Case Study.		
Internal Continuous Assessment (ICA):		
ICA should consist of Solving 8- 10 practical assignments on above units		
Text Books		
<ol style="list-style-type: none"> 1. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2014. (Unit- I and II) 2. Glenn J. Myatt, Making sense of Data: A practical Guide to Data Visualization, Advanced Data Mining Methods and Applications, John Wiley Publishers, 2009. (Unit-V) 3. Python Data Science Handbook – Essential Tools for working with Data: Jake VanderPlas, O’rielly (Unit III, IV, VI) 		
Reference Books		
<ol style="list-style-type: none"> 1. "Python for Data Analysis" by Wes McKinney- O'Reilly Media 2. "Python Data Science Handbook" by Jake VanderPlas-O'Reilly Media 		

