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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. Computer Science and Engineering
W.E.F. 2025-26

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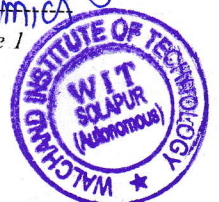
Computer Science and Engineering
Walchand Institute of Technology
Solapur 413006.

Walchand Institute of Technology, Solapur

S.Y.B.Tech.(CSE) Syllabus w.e.f. 2025-26

Manual
Dr. Mrs. M. A. Nirgude
Dean Academics

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Computer Science and Engineering

Vision

To develop professional engineers in Computer Science & Engineering having ethical values, research aptitude and ability to address challenges of modernization in the IT industry aiming at overall sustainable development of the society.

Mission

- M1 - To impart quality education in the field of Computer Science & Engineering in accordance with the needs of the Modernization & Globalization through technology enabled education.
- M2 - To inculcate lifelong learning in students to face challenges posed by ever-changing IT career landscape as a disciplined professional with a sense of professional ethics.
- M3 - To inculcate critical thinking and creativity for identifying various societal issues and to provide solutions.
- M4 - To enhance career opportunities for students through academia-industry interaction and research.

Computer Science and Engineering

Program Educational Objectives (PEOs)

1. Graduate will exhibit strong fundamental knowledge and technical skills in the field of Computer Science & Engineering to pursue successful professional career, higher studies and research.
2. Graduate will exhibit capabilities to understand and resolve various societal issues through their problem solving skills.
3. Graduate will be sensitive to ethical, societal and environmental issues as a software engineering professional and be committed to life-long learning.

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 the principles of computational mathematics, computer systems and programming paradigms to solve computational problems.
2. Design and develop application software with functionalities applicable for desktop, web and mobile applications with due consideration of system software constraints.
3. Apply software engineering methods, cutting edge technologies and ICT, using appropriate tools and FOSS alternatives for designing, developing & testing application software.

Computer Science and Engineering Department

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

Computer Science and Engineering

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	CourseType		Course Serial No 1-9	T-Theory, L-Lab session P- Programming

Program Code

CS	Computer Science and Engineering
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

23CSU3CC1T	Discrete Mathematics Structures
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Computer Science and Engineering

B. Tech. Semester III

Course Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
		L	T	P		ESE	OE/ POE	ISE	ICA	
24CSU3CC1T	Discrete Mathematics Structures	3	--	--	3	60	--	40	--	100
24CSU3CC2T	Data Structures	2	--	--	2	60	--	40	--	100
24CSU3CC3T	Computer Graphics	2	--	--	2	60	--	40	--	100
24##U3ON*4T	Open Elective I	2	--	--	2	60	--	40	--	100
24##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
24CMU3VE7T	Universal Human Values	2	--	--	2	50*	--	--	--	50
Sub Total		14	2	--	16	350	--	200	75	625
Laboratory Courses										
24CSU3CC2L	Data Structures Lab	--		2	1	--	50	--	25	75
24CSU3CC3L	Computer Graphics Lab	--		2	1	--	--	--	25	25
24CSU3CC8P	Python Programming	1		2	2	--	50	25	25	100
24CSU3FP9L	Community Engagement Project /Field Project	--		4	2	--	--	--	50	50
Subtotal		--	-	10	6	--	100	25	200	250
Grand Total		15	2	10	22	350	100	225	125	875



Computer Science and Engineering

B. Tech. Semester IV

Course Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
		L	T	P		ESE	OE/ POE	ISE	ICA	
24CSU4CC1T	Theory of Computation	3	--	--	3	60	--	40	--	100
24CSU4CC2T	Computer Networks	2	--	--	2	60	--	40	--	100
24CSU4CC3T	Microprocessor and Computer Architecture	2	--	--	2	60	--	40	--	100
24CSU4EM4T	Project Management	2	--	--	2	60	--	40	--	100
24##U4O45T	Open Elective II	2	--	--	2	60	--	40	--	100
24##U4O45T	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
Subtotal		15	2	--	17	300	--	300	75	675
Laboratory Courses										
24CSU4CC2L	Computer Networks Lab	--	--	2	1	--	25	--	25	50
24CSU4CC3L	Microprocessor and Computer Architecture Lab	--	--	2	1	--	--	--	25	25
24CSU4MD6L	Multidisciplinary Minor II Lab	--	--	2	1	--	--	--	25	25
24CSU4CC9P	OOP using JAVA	1	--	2	2	--	50	25	25	100
24CSU4VE10P	Mobile Application Development	1	--	2	2	--	--	--	50	50
Sub total		2	--	10	7	--	75	--	150	250
Grand Total		17	2	10	24	300	75	325	225	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
- *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	24CEU3O15T	Managerial Economics
2	24MAU3O25T	Renewable Energy
3	24ETU3O35T	Sustainable Development
4	24CSU3O45T	Management Information Systems
5	24ECU3O55T	Fundamentals Of Digital Marketing
6	24ITU3O65T	Cyber Laws

Open Electives- II (Semester-IV)

Sr. No.	Subject Code	Subject
1	24GEU4O14T	Higher Engineering Mathematics
2	24GEU4O24T	Advanced Engineering Mathematics
3	24GEU4O34T	Applied Mathematics
4	24GEU4O44T	Statistics and Fuzzy logic
5	24GEU4O54T	Applied Statistics

- 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 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**

Student 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 Engineering
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
(An Autonomous Institute)
Second Year B.Tech. (Computer Science and Engineering), Semester-III

24CSU3CC1T - DISCRETE MATHEMATICAL STRUCTURES

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/week	ESE	60 Marks
Credits	3	ISE	40 Marks
Introduction:			
This course introduces discrete mathematics which deals with fundamentals of mathematical reasoning and set theory. The course also introduces theoretical and mathematical aspects of relations, functions, algebraic system & Boolean algebra.			
Course Prerequisite:			
Student shall have knowledge of basic mathematics			
Course Objectives:			
<ol style="list-style-type: none"> To introduce the fundamental principle of counting. To get acquainted to basic connectives and find equivalent formulas and normal forms. To draw implications from basic primitives. To introduce set theory and relations with illustrations. To introduce the concepts of functions and its types through scenarios. To define types of algebraic systems and applications 			
Course Outcomes:			
Students will be able to:			
<ol style="list-style-type: none"> Solve the problems related to the permutation, combination and mathematical induction Apply mathematical logic to arrive at inference from the given premises. Use the associated operations and terminologies to solve logical problems for sets, functions, and relations. Classify algebraic systems based on its properties and select an appropriate for given application. 			
Unit – I	Fundamental Principles of Counting	8 Hours	
Two basic counting principles, Permutations, permutations with repetition, combinations, combinations with repetition, the principles of mathematical induction, Pigeon hole Principle.			
Unit – II	Mathematical Logic	6 Hours	
Introduction, statements and Notation, Connectives-negation, conjunction, disjunction, conditional, biconditional, statement formulas and truth tables, well-formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives.			
Unit – III	Representation of Expressions	8 Hours	
Normal & Principle normal forms, completely parenthesized infix & polish notations, Theory of inference for statement calculus.			



Unit – IV	Set Theory, Relations and Function	7 Hours
Basic concepts of set theory, types of operations on sets, ordered pairs, Cartesian product, Relations, Properties of binary relations, Matrix and graph representation, Partition and covering of set, Equivalence relation, Composition, Function-types, Composition of functions, Inverse functions		
Unit – V	Algebraic Systems	8 Hours
Algebraic Systems, Semi-groups, Monoids and Groups, Properties and example, Group codes		
Unit – VI	Lattices and Boolean algebra	8 Hours
POSET and Hasse diagram, Lattice as POSETs, definition, examples and Properties, Special Lattices, Boolean algebra definition and examples, Boolean functions.		
Text Books		
1. Discrete mathematical structures with applications to computer science - J.P.Tremblay & R. Manohar (M G H International)		
2. Discrete Mathematics with combinatorics and graph theory-S.SNTHA (CENGAGE Learning)		
Reference Books		
1. Discrete Mathematical Structures–Bernard Kolman, Robert C. Busby (Pearson Education)		
2. Discrete mathematics-Liu (MGH)		
3. Theory and problems in Abstract algebra – Schaums outline series (MGH)		
4. Discrete Mathematical Structures-Y N Singh (WILEY)		
5. Discrete Mathematics and Its Applications, Chakraborty & Sarkar, Oxford		
6. Discrete Structures, S.B.Singh, Khanna Book Publishing, Delhi		
7. Discrete Mathematics, T. Veerarajan, Tata McGraw-Hill		
8. Discrete Mathematics with Proof, Eric Gossett, Wiley India (2 nd Edition)		



WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Computer Science and Engineering), Semester-III

24CSU3CC2T – 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:

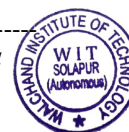
1. To introduce students to various data structures.
2. To develop programming skills to implement and analyze linear and nonlinear data structures.
3. To identify and apply the suitable data structure for problem solving.

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.		



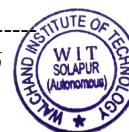
Unit – IV	Trees	6 Hours
Definition, traversal, linked implementation, operations on Binary Trees and Binary Search Trees, Introduction Multiway Trees, B trees, B+ trees.		
Unit – V	Height Balanced Trees	4 Hours
The general method, 8-queens problem, sum of subsets, Hamilton cycle, graph coloring, knapsack problem.		
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):		
Assignment Topics		
1,2 Stack		
3,4 Queue, Circular Queue		
5,6,7 Singly Linked list, Doubly Linked List, Circular Linked list.		
8,9 Stack, Queue using Linked list		
10 Additional of polynomials using Linked list		
11,12 Binary Search Tree		
13,14 Graph		
Text Books		
1. Data Structure and Program Design in C by Robert Kruse/C.L.Tonda/BruceLeung second edition, Pearson Education, Prentice Hall.		
2. Data Structures: A Pseudo Approach with C. by Richard.F.Gilberg & Behrouz A. Forouzan, second edition, Cengage Learning		
3. 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, Augenstein, 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
(An Autonomous Institute)
Second Year B.Tech. (Computer Science and Engineering), Semester-III

24CSU3CC3T - COMPUTER GRAPHICS

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 basics of computer graphics and different basic graphics functions. It also elaborates the concepts of 2D and 3D computer graphics. In this course, topics include geometric modeling, 3D viewing and projection, lighting and shading, color and the use of one or more technologies and packages such as OpenGL.			
Course Objectives:			
1. To introduce basics elements of computer graphics and demonstrate the line, circle and polygon filling algorithms for creating graphical figure. 2. To demonstrate 2D and 3D transformations. 3. To introduce clipping algorithms, hidden & visible surfaces and different types of curves.			
Course Outcomes:			
1. To define the fundamentals of computer graphics & use of various functions for generating and rendering graphical figures. 2. Apply 2D/3D transformations to a given object and create 2D/3D animations. 3. Demonstrate different clipping algorithms, surfaces and different types of curves.			
Unit – I	Basic Concepts & Raster scan Graphics	5 Hours	
Introduction, Application areas of Computer Graphics, Raster scan display, Random scan display. Output Primitives : Points and lines, DDA Line drawing, Bresenham's Line and Circle drawing algorithms			
Unit – II	Introduction to Light and Color Modelling	4 Hours	
Introduction to Object-Rendering, Light Modeling Techniques, illumination Model, Shading, Flat Shading, Color Models.			
Unit – III	2D Geometric Transformations	6 Hours	
2D Transformation: Translation, Rotation, Reflection, Scaling, Shearing, Reflection through an arbitrary line.			
Unit – IV	3D Geometric Transformations	4 Hours	
3D Transformation : Scaling, Shearing, Rotation, Reflection Translation, Rotation about axis parallel to coordinate axis.			
Unit – V	2D Viewing and 3D Viewing	6 Hours	



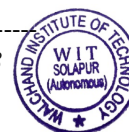
Introduction to Viewing transformation, Sutherland and-Cohen line clipping algorithm, Midpoint Subdivision algorithm, Introduction to curve generation, Non parametric & parametric curves.		
Unit – VI	Visible Lines & Visible Surfaces	7 Hours
Hidden surfaces : introduction, back-face removal algorithm : Painter’s algorithm, Z–buffer, Fractal lines and surfaces.		
Internal Continuous Assessment (ICA):		
Student should perform 8 to 10 experiments based on OpenGL or any other freely available framework		
<ol style="list-style-type: none"> 1. Implementation of different graphics functions for object rendering with light and color modeling 2. Implementation of DDA line drawing algorithm. 3. Implementation of Bresenham’s line drawing algorithm. 4. Implementation of Bresenham’s Circle generation algorithm. 5. Implement polygon drawing and filling functions. 6. Implement 2D transformation. 7. Implementation of 3D transformation. 8. Implement Sutherland–Cohen line clipping algorithm. 9. Implement Mid-point subdivision algorithm. 10. Implement a small animation package using Synfig or any other freely available framework. 		
Text Books		
<ol style="list-style-type: none"> 1. Computer Graphics – Donald Hearn, Baker (second edition) PHI publications. 2. Edward Angel, Dave Shreiner, Interactive Computer Graphics, A Top-Down Approach With Shader-Based OPENGL, 6th Edition, Pearson Education. 3. Procedural elements for Computer Graphics – David F. Rogers (second edition) Tata McGraw Hill publications. 4. Mathematical elements for Computer Graphics-Rogers, Adams (second edition) McGraw Hill Publishing Company. 		
Reference Books		
<ol style="list-style-type: none"> 1. John F. Hughes, Andries Van Dam, MORGANMCGUIRE, Computer Graphics-Principles and Practice, Third Edition, Pearson Education. 2. Dipti P. Mukherjee, “Fundamentals of Computer Graphics and Multimedia”, PHI, ISBN- 978-81-203-1446-7 3. F. Hill, “Computer Graphics: Using OpenGL”, Second Edition, Pearson Education, ISBN 81- 297-0181-2 4. Shah M. B. and B.C. Rana, “Engineering Drawing and Computer Graphics”, Pearson, ISBN- 978-81-317-5611-9 5. Principals of Interactive Computer Graphics-William Newman, Sproull (second edition) McGraw-Hill Publication. 		



WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Computer Science and Engineering), Semester-III

24CMU3EM5T : ENTREPRENEURSHIP DEVELOPMENT

Teaching Scheme		Examination Scheme	
Lectures	1 Hour/week	ICA	50 Marks
Practical	1 Hour/week		
Introduction:			
<p>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.</p>			
Prerequisite:			
No special prerequisite for this course.			
Course Objectives:			
<ol style="list-style-type: none"> 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:			
<p>After completing this course, student shall be able to -</p> <ol style="list-style-type: none"> 1. Identify various characteristics of entrepreneurs & also various types of entrepreneurs. 2. Evaluate the challenges and limitations faced by Entrepreneurship Development Programmes (EDPs) in achieving their goals. 3. Generate business ideas and prepare a comprehensive entrepreneurial project report 4. Compare different structures, ownership forms, funding options & interpret the role of government support systems in promoting entrepreneurship. 			
Unit – I	Entrepreneur		3 Hours
Concept, meaning and definitions of entrepreneur, need of entrepreneur, intrapreneur, socialentrepreneur, 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, DreamTech 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/		

**WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR****(An Autonomous Institute)****Second Year B.Tech. (Computer Science and Engineering), Semester-III****24CMU3VE7T : 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 complementarity 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,	7 Hours
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Content and Process for Value Education:		
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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		
<ol style="list-style-type: none"> 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		
<ol style="list-style-type: none"> 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, Common wealth Purblishers.
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/16eOka8AoBpLGICDajRvk4MXgfXQWzFCB?usp=sharing>
9. UHV-II handouts
<https://drive.google.com/drive/folders/15eHkMVguzRBDrb65GFj7jMN6UEP5JEk1?usp=sharing>



WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(An Autonomous Institute)
Second Year B.Tech. (Computer Science and Engineering), Semester-III

24CSU3CC8P : 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 remarkable 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:			
<ol style="list-style-type: none">1. To introduce the core components of Python programming language.2. To study library packages to write applications using python.3. To study exception handling and debugging python programs.4. To study file handling and multithreading programming.			
Course Outcomes:			
At the end of the course students will be able to			
<ol style="list-style-type: none">1. Understand and build basic programs using fundamental programming constructs like variables, conditional logic, looping, and Data Structures.2. Apply Functions and Object Oriented Programming Concepts for Solving real world applications.3. Design and implement Python modules and packages effectively and apply appropriate testing and debugging methods.4. Understand and apply file handling technique in python and use multithreading concepts for parallel programming.			
Unit – I	Introduction to Python		3 Hours
Introduction to Python, Tokens in Python, Input and Print functions. Control Structures : Selective statements and Iterative statements			
Unit – II	Collections and String handling		3 Hours
Collections in Python: List, Tuples, Dictionary, Sets and frozen Sets. Strings: Operations and methods, Regular Expressions.			
Unit – III	Functions in Python		1 Hours
Functions, Recursion, Lambda functions, Generators, Higher Order Functions.			
Unit – IV	Object Oriented Programming in Python		2 Hours



OOP Basics, Abstraction, Encapsulation, Aggregation, Inheritance and Polymorphism.		
Unit – V	Python Modules, Packages, Testing, Debugging	3 Hours
Introduction to Modules, Packages, Python Modules: Math, Random, Time and Regular Expression. Errors and Exceptions: Handling Exceptions and User defined Exceptions, Unit tests in Python, Debugging programs.		
Unit – VI	File Handling and Multithreading	3 Hours
File Handling –Files Operations, Multithreading : Thread-based parallelism and Process-based parallelism.		
Internal Continuous Assessment (ICA):		
<ul style="list-style-type: none"> • ICA shall include at least ten assignments based on following topics. <ol style="list-style-type: none"> 1. Installation of Python and PyCharm IDE on Windows. 2. Fundamentals of Python: Input and Print Functions, Control Structures etc. 3. Collections in Python. 4. String handling. 5. Functions and Recursion in Python. 6. Abstraction, Aggregation and Encapsulation in Python. 7. Inheritance and Polymorphism. 8. Python Modules and Packages. 9. Errors and Exception handling. 10. Unit Testing and Debugging. 11. File handling in Python. 12. Multithreading in Python. • The assignment's objective should align with course's outcomes and focus on higher order bloom's cognitive levels. 		
Text Books		
1. Programming in Python 3, Mark Summerfield, Second Edition		
Reference Books		
1. Python Cookbook, David Beazley and Brian K. Jones, Third Edition, Shroff Publishers & Distributors Pvt. Ltd., ISBN: 978-93-5110-140-6 2. Learning Python, Mark Lutz, 5th edition 3. Programming Python (English), Mark Lutz, 4th Edition 4. Testing Python, David Sale, Wiley India (P) Ltd., ISBN: 978-81-265-5277-1		
E-resources		
Python documentation- https://docs.python.org/3/		



WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Computer Science and Engineering), Semester-III

24CSU3FP9L : 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

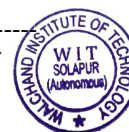
Course Outcomes:

After completing this course, student shall be able to -

1. Apply the knowledge to solve the 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 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

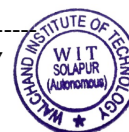
Examples of community engagement / field projects are as below:

- 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



24CSU4CC1T - 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:			
<ol style="list-style-type: none"> 1. To introduce the computational principles to build regular expressions for 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 machine. 			
Course Outcomes:			
Students will be able to			
<ol style="list-style-type: none"> 1. Build regular expression 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 machine 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 ϵ 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 ϵ 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		
<ol style="list-style-type: none"> 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		
<ol style="list-style-type: none"> 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. (Computer Science and Engineering), Semester-IV

24CSU4CC2T : 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
		OE	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):		
<ol style="list-style-type: none"> 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		
<ol style="list-style-type: none"> 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		
<ol style="list-style-type: none"> 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
(An Autonomous Institute)
Second Year B.Tech. (Computer Science and Engineering), Semester-IV

24CSU4CC3T : MICROPROCESSOR AND COMPUTER ARCHITECTURE

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 to develop an in-depth understanding of the concepts of microprocessor, assembly language programming and computer architecture.

Course Prerequisite:

Knowledge of Digital Techniques

Course Objectives:

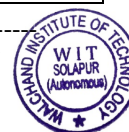
1. To introduce 8086 microprocessor architecture and its functionalities.
2. To implement microprocessor-based programs for various applications.
3. To introduce basics concepts of computer architecture.

Course Outcomes:

Students will be able to

1. Write an 8086 Assembly language program.
2. Comprehend the basic principles of 8086 interrupts, direct memory access and fundamentals of computer design.
3. Analyze the structure and functions of cache memory.
4. Identify and analyze various forms of ILP, including pipelining and hazards.

Unit – I	The Microprocessor and Its Architecture	5 Hours
Internal Microprocessor Architecture-8086, Real Mode Memory Addressing, Addressing mode, Directives.		
Unit – II	Instructions	5 Hours
Data Movement Instructions, Arithmetic and Logical Instructions, Program Control Instructions, Interrupt Instructions, Miscellaneous instructions.		
Unit – III	Interrupts and DMA	5 Hours
Basic Interrupt Processing, Hardware Interrupts, 8259 -Programmable Interrupt Controller, Block diagram of DMA Controller (IC 8257).		
Unit – IV	Fundamentals of Computer Design	5 Hours
Classes of computers, Defining Computer Architecture, Trends in Technology, Trends in Cost, Quantitative Principles of Computer Design		
Unit – V	Memory Hierarchy Design	5 Hours



Introduction, Eleven Advanced Optimization of Cache Performance, RAM Cell, Associative Cache, Direct Mapped Cache		
Unit – VI	Instruction Level Parallelism	5 Hours
Instruction Level Parallelism: Concepts and Challenges, Basic Compiler Techniques for Exposing ILP, Overcoming Data Hazards with Dynamic Scheduling.		
Internal Continuous Assessment (ICA): Student should perform minimum 8 assignments based on below topics		
<ol style="list-style-type: none"> 1. ALP based on data movement instructions. 2. ALP based on arithmetic instructions. 3. ALP based on logical instructions. 4. ALP based on program control instructions. 5. ALP based on interrupt instructions. 6. ALP based on interfacing. 7. Design and simulate 1 bit RAM Cell (Single bit memory). 8. Design and simulate associative cache for given parameter. 9. Design and simulate direct mapped cache for given parameter. 10. Design a single instruction/more instruction CPU. 		
Tools/Simulator:		
MASM/TASM/V Lab Simulator/Any other tools or simulator Vlab link http://vlabs.iitkgp.ernet.in/coa/# https://cse11-iiith.vlabs.ac.in/List%20of%20experiments.html?domain=Computer%20Science		
Text Books		
<ol style="list-style-type: none"> 1. The Intel Microprocessors: Architecture, Programming & Interfacing PHI- Barry B.Brey (Unit 1, 2,3) 2. Computer Architecture, A Quantitative Approach, John L. Hennessey and David A. 3. Patterson: 4th Edition, Elsevier (Unit 4,5,6) 4. A K Ray & K M Bhurchandi - Advanced Microprocessors and Peripherals 		
Reference Books		
<ol style="list-style-type: none"> 1. Liu & Gibson-MicrocomputerSystem8086 /8088 PHI, 2ndEdition. 2. D.V. Hall-Microprocessor and Interfacing Programming & Hardware TMH–2nd Edition- 3. Advanced Computer Architecture - Parallelism, Scalability, Programmability-Kai Hwang-Tata McGraw Hill. 		

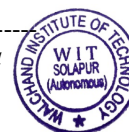




WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(An Autonomous Institute)
Second Year B.Tech. (Computer Science and Engineering), Semester-IV

24CSU4VE10P : MOBILE APPLICATION DEVELOPMENT

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/week	ICA	25 Marks
Practical	2 Hours/week		
Credits	4		
Introduction:			
Mobile application development course will build your skills in creating mobile apps for Android platform as well as for Cross platform. This course includes Android application development and Flutter Application development with basic User Interface design, basic building blocks, data handling, testing mobile apps and how to take app to the market.			
Course Pre-requisite:			
Knowledge of programming paradigms and object-oriented programming principles.			
Course Objectives:			
<ol style="list-style-type: none"> 1. Identify and evaluate various mobile development frameworks and methodologies to determine the most appropriate approach for a given application. 2. Design and implement a functional cross-platform mobile application using industry-standard development tools and best practices. 3. Apply effective testing strategies and deployment techniques to ensure the mobile application meets performance, security, and distribution standards. 			
Course Outcomes:			
At the end of this course students will be able to			
<ol style="list-style-type: none"> 1. Select suitable development practices for a mobile application 2. Build cross platform mobile application for a given problem scenario. 3. Choose suitable method of testing, signing, packaging and distribution for a mobile application. 			
Unit – I	Introduction		2 Hours
Introduction to Kotlin, building first android application, build basic layout, Dice roller app, get user inputs, Display a scrollable list			
Unit – II	Navigation and Connect to the internet		2 Hours
Navigation between screens, Introduction to the navigation component, Architecture components, Advanced Navigation App example, Adaptive layouts, Coroutines, Get and display data from the internet			
Unit – III	Data Persistence and Work Manager		3 Hours
Introduction to SQL, Rooms, and Flow, Room for data persistence, schedule tasks with work manager			



Unit – IV	Introduction to Dart	2 Hours
Introduction, Syntax basics, Types, Patterns, Functions, Control Flow, Error Handling, Classes & Objects, Concurrency, Null Safety		
Unit – V	Building application with Flutter and Introduction to Firebase	3 Hours
Introduction to widgets, Building Layouts, Navigation and Routing, Animations, Introduction to firebase		
Unit – VI	Platform Integration and Testing & Debugging	3 Hours
Supported Platforms, Building Desktop apps with flutter, writing platform specific code, Debugging tools, Testing plugins, Debugging Flutter apps programmatically, Flutter’s build modes, Common Flutter errors, Handling errors, Testing, Integration testing.		
Internal Continuous Assessment (ICA):		
<ol style="list-style-type: none"> Building a Basic Android App in Kotlin: Develop a simple Android application using Kotlin that includes a basic layout and handles user inputs. Dice Roller App Enhancement: Modify the Dice Roller app to allow users to customize the number of dice and animate the rolling process. Implementing Scrollable Lists: Create an Android app that displays a scrollable list using RecyclerView, incorporating user interaction. Navigation Component Exploration: Design an Android app with multiple screens, implementing navigation between screens using the Navigation Component. Fetching and Displaying Online Data: Build an Android application that retrieves data from an open API and displays it using adaptive layouts and coroutines. Data Persistence with Room Database: Develop an Android app that utilizes Room database for data persistence and demonstrates SQL queries using Flow. Task Scheduling Using Work Manager: Implement an Android app that schedules background tasks using Work Manager to fetch and store data periodically. Dart Programming Challenges: Write Dart programs to demonstrate various programming concepts such as classes, objects, control flow, concurrency, and null safety. Flutter-Based App Development with Firebase: Create a Flutter application integrating Firebase for user authentication and real-time data storage. Platform-Specific Code and Debugging in Flutter: Develop a Flutter desktop application that includes platform-specific code, debugging tools, and error handling. 		
Text Books		
Android Application Development - All in one for Dummies, Barry Burd.		
Reference Books		
Android Developer Tools Essentials by Mike Wolfson (O'Reilly Media)		
e-Resources :		
<ol style="list-style-type: none"> Android Developer Resources: https://developer.android.com/courses/android-basics-kotlin/course Dart Resources: https://dart.dev/guides Flutter Resources: https://docs.flutter.dev/ 		



WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(An Autonomous Institute)
Second Year B.Tech. (Computer Science and Engineering), Semester-IV

24CSU4EM4T : 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. (Computer Science and Engineering), Semester-IV

24CMU4AE7T : 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
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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 <ol style="list-style-type: none"> Resume Creation: Students will prepare a one-page ATS friendly resume tailored to their Job description Email and Letter Writing: Each student will draft a formal email and a cover letter intended for a job application Notice, Agenda and Minutes of Meeting Writing: Write the Notice, agenda and Minutes of Meeting in a business setting Public Speaking: Just a Minute & Elevator pitch activities. 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. 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. 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 Mock Personal Interviews: Students will undergo mock HR, simulations in front of peers and instructors, followed by personalized feedback on performance and body language. Body Language: Record the responses of students during the interview and instructor will analyse their body language and provide personalised feedback 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. Time Management Activity: Students will be preparing Vision Board activity where they have to set their long-term goal chronologically Leadership and Teamwork Exercise: Solving and discussing Self and Business Case studies 		
Text Books		
<ol style="list-style-type: none"> Soft Skills: An Integrated Approach to Maximize Personality – Gajendra Singh Chauhan & Sangeeta Sharma, Wiley India Pvt. Ltd. Communication Skills for Professionals – Nira Konar, PHI Learning, 3rd Edition, 2022. 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

(An Autonomous Institute)

Second Year B.Tech. (Computer Science and Engineering), Semester-IV

24CMU4VE8T : 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		
<ol style="list-style-type: none"> 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		
<ol style="list-style-type: none"> 1. Charles E. Harris Jr., Michael S. Pritchard and Michael J. Rabins, Engineering Ethics: 		



WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
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Second Year B.Tech. (Computer Science and Engineering), Semester-IV

24CSU4CC9P: 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:			
<ol style="list-style-type: none"> 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			
<ol style="list-style-type: none"> 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 Builder 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) :		
<ul style="list-style-type: none"> • ICA shall consist of minimum 10 practical assignments based on following list: <ol style="list-style-type: none"> 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 recommend to enhance hands-on skills in Java Programming of Students. 		
Text Books		
<ol style="list-style-type: none"> 1. Head First Java, Kathy Sierra, Bert Bates, O’Reilly Publication 2. The Java™ 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		
<ol style="list-style-type: none"> 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 Java™ 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. (Computer Science and Engineering), Semester-IV

24CSU4VE10P : MOBILE APPLICATION DEVELOPMENT

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/week	ICA	25 Marks
Practical	2 Hours/week		
Credits	4		

Introduction:

Mobile application development course will build your skills in creating mobile apps for Android platform as well as for Cross platform. This course includes Android application development and Flutter Application development with basic User Interface design, basic building blocks, data handling, testing mobile apps and how to take app to the market.

Course Pre-requisite:

Knowledge of programming paradigms and object-oriented programming principles.

Course Objectives:

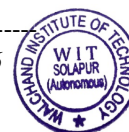
1. Identify and evaluate various mobile development frameworks and methodologies to determine the most appropriate approach for a given application.
2. Design and implement a functional cross-platform mobile application using industry-standard development tools and best practices.
3. Apply effective testing strategies and deployment techniques to ensure the mobile application meets performance, security, and distribution standards.

Course Outcomes:

At the end of this course students will be able to

1. Select suitable development practices for a mobile application
2. Build cross platform mobile application for a given problem scenario.
3. Choose suitable method of testing, signing, packaging and distribution for a mobile application.

Unit – I	Introduction	2 Hours
Introduction to Kotlin, building first android application, build basic layout, Dice roller app, get user inputs, Display a scrollable list		
Unit – II	Navigation and Connect to the internet	2 Hours
Navigation between screens, Introduction to the navigation component, Architecture components, Advanced Navigation App example, Adaptive layouts, Coroutines, Get and display data from the internet		
Unit – III	Data Persistence and Work Manager	3 Hours
Introduction to SQL, Rooms, and Flow, Room for data persistence, schedule tasks with work manager		



Unit – IV	Introduction to Dart	2 Hours
Introduction, Syntax basics, Types, Patterns, Functions, Control Flow, Error Handling, Classes & Objects, Concurrency, Null Safety		
Unit – V	Building application with Flutter and Introduction to Firebase	3 Hours
Introduction to widgets, Building Layouts, Navigation and Routing, Animations, Introduction to firebase		
Unit – VI	Platform Integration and Testing & Debugging	3 Hours
Supported Platforms, Building Desktop apps with flutter, writing platform specific code, Debugging tools, Testing plugins, Debugging Flutter apps programmatically, Flutter’s build modes, Common Flutter errors, Handling errors, Testing, Integration testing.		
Internal Continuous Assessment (ICA) :		
<ol style="list-style-type: none"> Building a Basic Android App in Kotlin: Develop a simple Android application using Kotlin that includes a basic layout and handles user inputs. Dice Roller App Enhancement: Modify the Dice Roller app to allow users to customize the number of dice and animate the rolling process. Implementing Scrollable Lists: Create an Android app that displays a scrollable list using RecyclerView, incorporating user interaction. Navigation Component Exploration: Design an Android app with multiple screens, implementing navigation between screens using the Navigation Component. Fetching and Displaying Online Data: Build an Android application that retrieves data from an open API and displays it using adaptive layouts and coroutines. Data Persistence with Room Database: Develop an Android app that utilizes Room database for data persistence and demonstrates SQL queries using Flow. Task Scheduling Using Work Manager: Implement an Android app that schedules background tasks using Work Manager to fetch and store data periodically. Dart Programming Challenges: Write Dart programs to demonstrate various programming concepts such as classes, objects, control flow, concurrency, and null safety. Flutter-Based App Development with Firebase: Create a Flutter application integrating Firebase for user authentication and real-time data storage. Platform-Specific Code and Debugging in Flutter: Develop a Flutter desktop application that includes platform-specific code, debugging tools, and error handling. 		
Text Books		
Android Application Development - All in one for Dummies, Barry Burd.		
Reference Books		
Android Developer Tools Essentials by Mike Wolfson (O'Reilly Media)		
e-Resources :		
<ol style="list-style-type: none"> Android Developer Resources: https://developer.android.com/courses/android-basics-kotlin/course Dart Resources: https://dart.dev/guides Flutter Resources: https://docs.flutter.dev/ 		