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. Information Technology
W.E.F. 2025-26

HEAD
Information Technology Deptt
W.I.T., Solapur
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Dr. Mrs. M.A. Nirgude
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	thics, 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).

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

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 **N*** *indicates the serial number of electives offered in the respective category*
EN*	Core Elective **N*** *indicates the serial number of electives offered in the respective category*
ON*	Open Elective **N*** *indicates the serial number of electives offered in the respective category*
SK	Skill Based Course
SM	Seminar

MP	Mini project
PR	Project
IN	Internship

Sample Course Code	
23ITU3CC1T	Discrete Mathematics Structures

Department of Information Technology

B. Tech. Semester III

Course Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
		L	T	P		Theory	OE/ POE	ISE	ICA	
24ITU3CC1T	Discrete Mathematical Structures	2	-	-	2	60	-	40	-	100
24ITU3CC1A	Discrete Mathematical Structures (Tutorial)	-	1	-	1	-	-	-	25	25
24ITU3CC2T	Data Structures	2	-	-	2	60	-	40	-	100
24ITU3CC3T	Computer Graphics	2	-	-	2	60	-	40	-	100
24GEU3O44T	Open Elective I (Statistics and Fuzzy Logic)	2	-	-	2	60	-	40	-	100
24GEU3O44A	Open Elective I (Statistics and Fuzzy Logic) (Tutorial)	-	1	-	1	-	-	-	25	25
24CMU3EM5T	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
	Subtotal	11	5	-	16	350	-	200	100	650
Laboratory Courses										
24ITU3CC2L	Data Structures Lab	-	-	2	1	25	-	-	25	50
24ITU3CC3L	Computer Graphics Lab	-	-	2	1	-	-	-	25	25
24ITU3CC8P	Object Oriented Programming Using Java	1	-	2	2	50	-	25	25	100
24ITU3FP9L	Community Engagement Project / Field Project	-	-	4	2	-	-	-	50	50
	Subtotal	1	-	10	6	75	-	25	125	225
	Grand Total	12	5	10	22	425	-	225	225	875

Note:

- *Examination will be MCQ based.
- N* indicates the serial number of electives offered in the respective category
- ## indicates program code of offering Programme
- **For Open Elective (OE) III in Semester V:**

- Students are required to enroll 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.
- 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.
- Students may enroll for the course in Semester III, IV or V. They must complete all assignments and appear for the certification examination conducted by SWAYAM/NPTEL.
- 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.
- **List of Open Electives:**
  Open Electives I (Semester-III)

Sr. No.	Subject Code	Subject
1	24GEU3O14T	Higher Engineering Mathematics
2	24GEU3O24T	Advanced Engineering Mathematics
3	24GEU3O34T	Applied Mathematics
4	24GEU3O44T	Statistics and Fuzzy logic
5	24GEU3O54T	Applied Statistics

- **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
4	Electronics and Computer Engineering	Analog Electronics	Digital Electronics	Microcontrollers and Peripherals	Advanced Controllers and Interfacing	Electronic System Design

Department of Information Technology

B. Tech. Semester IV

Course Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
		L	T	P		Theory	OE/ POE	ISE	ICA	
24ITU4CC1T	Theory of Computation	2	-	-	2	60	-	40	-	100
24ITU4CC1A	Theory of Computation (Tutorial)	-	1	-	1	-	-	-	25	25
24ITU4CC2T	Microprocessors and Computer Architecture	2	-	-	2	60	-	40	-	100
24ITU4CC3T	Computer Networks	2	-	-	2	60	-	40	-	100
24ITU4CC4T	Mathematical Foundation for AI, ML and Data Science	2	-	-	2	-	-	-	50	50
24##U4ON*5T	Open Elective II (Cyber Laws)	2	-	-	2	60	-	40	-	100
24##U4ON*5A	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
24ITU4EM9T	Business Economics	2	-	-	2	60	-	40	-	100
	Subtotal	**16**	**3**	**-**	**19**	**300**	**-**	**300**	**150**	**750**
Laboratory Courses										
						ESE				
						POE	OE			
24ITU4CC2L	Microprocessors and Computer Architecture Lab	-	-	2	1	-	-	-	25	25
24ITU4CC3L	Computer Networks Lab	-	-	2	1	-	25	-	25	50
24##U4MD6L	Multidisciplinary Minor II Lab	-	-	2	1	-	-	-	25	25
24ITU4VE10P	Python Programming	1	-	2	2	-	50	-	25	75
	Subtotal	**1**	**-**	**8**	**5**	**-**	**75**	**-**	**100**	**175**
	Grand Total	**17**	**3**	**8**	**24**	**300**	**75**	**300**	**250**	**925**

Mandatory Course Environmental Studies Course will be taught in both Semester III and IV whereas the assessment will be a Semester IV has End Sem examination.

Course Code	Name of Course	Engagement Hours			Credits	SA		FA		Total
		L	T	P		Theory	OE/POE	ISE	ICA	
24CMU4MC2T	Environmental Studies	1	-	-	-	50	-	-	-	50

Note:

- *Examination will be MCQ based.
- N* indicates the serial number of electives offered in the respective category
- ## indicates program code of offering Programme
- **For Open Elective (OE) III in Semester V:**
  1. Students are required to enroll 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 enroll 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.
- **List of Open Electives:**
  Open Electives II (Semester-IV)

Sr. No.	Subject Code	Subject
1	24CEU4O15T	Managerial Economics
2	24MAU4O25T	Renewable Energy
3	24ETU4O35T	Sustainable Development
4	24CSU4O45T	Management Information Systems
5	24ECU4O55T	Fundamentals of Digital Marketing
6	24ITU4O65T	Cyber Laws

24ITU3CC1T: DISCRETE MATHEMATICAL STRUCTURES

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/week	ESE	60 Marks
Tutorial	1 Hours/week	ISE	40 Marks
Credits	3	ICA	25 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:

1. To get acquainted to basic connectives and find equivalent formulas and normal forms.
2. To draw implications from basic primitives.
3. To introduce set theory and relations with illustrations.
4. To introduce the concepts of functions and its types through scenarios.
5. To define types of algebraic systems and applications.

Course Outcomes:

After completing the course, students will be able to

1. Arrive at inference from the given premises applying mathematical logic
2. Select the associated operations and terminologies to solve logical problems for sets, functions, and relations.
3. Classify algebraic systems based on its properties and select an appropriate for given application.
4. Determine whether the poset is a Lattice based on its properties.

Unit – I	Mathematical logic	5 Hours

Introduction, statements and Notation, Connectives-negation, conjunction, disjunction, conditional, conditional, statement formulas and truth tables, well-formed formulas, Tautologies, Equivalence formulas, Tautological implications.

Unit – II	Representation of expressions	4 Hours

Normal & Principle normal forms, Theory of inference for statement calculus.

Unit – III	Set theory	3 Hours

Basic concepts of set theory, types of operations on sets, ordered pairs, Cartesian product.

Unit – IV	Relations	5 Hours

Relations, Properties of binary relations, Matrix and graph representation, Partition and covering of s
Equivalence relation, Composition, POSET and Hasse diagram.

Unit – V	Functions	4 Hours

Function-types, Composition of functions, Inverse functions.

Unit – VI	Algebraic systems	6 Hours

Algebraic systems, semi groups, groups and monoids, properties and example.

Unit – VII	Lattices and Boolean algebra	3 Hours

Lattice as POSETs, definition, examples and Properties, Special Lattices.

Internal Continuous Assessment (ICA):

In tutorial session, students of different batches should be assigned exercise problems and should guided for the solution. Minimum one tutorial per unit is expected.

Text Books

1. Discrete mathematical structures with applications to computer science -- J. P. Tremblay & R. Manohar (MGH International)
2. Discrete Mathematics with combinatorics and graph theory- S. SNTHA (CENGAGELearning

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, TataMcGraw-Hill

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

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Second Year B.Tech. (Information Technology), Semester-III

24ITU3CC2T: 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	25 Marks

Introduction:

This course introduces various data structures like searching sorting, stack, queue, linked list, trees, graphs, and hashing techniques. The course includes implementing various operations of these data structures and some applications.

Course Prerequisite:

This course requires prior knowledge of any basic 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. Describe and use stack data structure in different applications.
2. Implement queue and linked list data structures in a given problem
3. Analyze and Implement Tree and Graph data structures.
4. Identify appropriate usage of data structures for a given specific problem.

Unit – I	Introduction to Data Structures & Stack	6 Hours

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	7 Hours
Definition, traversal, linked implementation, operations on Binary Trees and Binary Search Trees: insert, delete, search operations, Multiway Trees, B trees, AVL Tree: Single and Double rotation of AVL Trees.		
Unit – V	Graphs	6 Hours
Definition, undirected and directed graphs, graph terminologies, computer representation of graphs, graph traversal methods: Depth First Search and Breadth First Search.		

Internal Continuous Assessment (ICA):

ICA shall consist of a minimum of 10 practical assignment problems based on all the above topics in line with the course outcome.

1. Perform matrix addition and multiplication.

2. Implement the following recursive functions:

    a. Factorial of a number b. N^{th} Fibonacci number c. Power function: xy

3. Implement stack data structure and its operations using arrays.

4. Implement stack data structure and its applications using arrays (Reverse a string, number of a's equal to b's, etc).

5. Convert Prefix expressions to Infix and Postfix expressions and evaluate using stack.

6. Implement queue data structure and its operations using arrays.

7. Implement singly-linked lists.

8. Implement doubly linked lists.

9. Implement circular linked lists.

10. Implement stack data structure and its operations using linked lists.

11. Implement queue data structure and its operations using linked lists.

12. Implement a Binary search tree

13. Implement a Binary tree traversal (Preorder. Postorder and Inorder)

14. Implement Graph data structure using an array

Text Books

1. Data Structures and Program Design in C by Robert Kruse/C.L.Tonda/Bruce Leung 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, Augensteen, Aason. M. Tanenbaum.
2. Data Structures and Algorithms by Prof. Maria S. Rukadikar, Shroff Publications.
3. Data Structures Through C in Depth by S.K. Shrivastava, Deepali Shrivastava, BPB Publications
4. Fundamentals of Data Structures, Sartaj Sahni, Computer Science Press, New York

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-III

24ITU3CC3T: 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:

Computer Graphics explores the creation and manipulation of visual content using computational techniques. This course covers fundamental concepts and practical skills, including raster and random scan graphics, 2D and 3D geometric transformations, light and colour modelling, and methods for handling visible lines and surfaces. Students will implement graphic algorithms and apply these concepts to real-world applications.

Course Prerequisite:

Basic Programming Skills: Proficiency in a programming language such as C, C++, or Java.

Mathematics: Understanding of linear algebra, trigonometry, and basic calculus.

Data Structures: Familiarity with basic data structures and algorithms.

Creative Thinking: An eye for design and creativity, to craft visually appealing and engaging graphics.

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 analyze and apply segment management, windowing, and line clipping in computer graphics.
4. To apply color theory and other key graphic design fundamentals to create visually appealing designs

Course Outcomes:

After completing the course, students will be able to
1. Define the fundamentals of computer graphics and use of various graphics functions for generating graphical figures.
2. Apply 2D/3D transformations to a given object and create 2D/3D animations.
3. Implement segment management, windowing transformations, and line clipping algorithms effectively.
4. Apply design principles and creative techniques to create, visually compelling graphics that effectively   engage and communicate with their target audience.

Unit – I	Introduction to Computer Graphics	6 Hours

Definition and Importance, Historical Development of Computer Graphics, Application Areas of Computer Graphics

Graphics Systems: Raster Scan and Random Scan Systems, Graphics Hardware: Monitors, Graphics Cards, and Input Devices, Basic Concepts of Pixels, Resolution, and Aspect Ratio

Unit – II	Graphics Programming Using C	4 Hours

Introduction to Graphics Programming: Overview of Graphics Libraries: Graphics.h, Setting Up the Graphics Environment in C

Basic Graphics Functions in C: Initializing Graphics Mode and Drivers, Drawing Basic Shapes: Lines, Circles, Rectangles, Using Colors and Patterns Advanced Graphics Functions: Drawing Polygons and Filling Them, Working with Text in Graphics Mode

Unit – III	Graphics Primitives for Drawing and Filling	6 Hours

Line and Circle drawing Algorithms: DDA, Bresenham's, Midpoint.

Polygon: Polygon and its types, inside test, polygon filling methods: Seed fill, Scan Line, Flood fill and Boundary fill

Unit – IV	Geometric Transformations	6 Hours

2DTranslation, scaling, rotation, reflection, shearing, matrix representation and homogeneous coordinate system, composite transformations.

3D Geometric Transformations: Translation, scaling, rotation, rotation about X, Y, Z and arbitrary axis reflection about XY, YZ, XZ and arbitrary plane.

Unit – V	Segments, Windowing and Clipping	6 Hours

Segment: Introduction, segment table, segment creation, closing, deleting and renaming, visibility.

Windowing: Concept of window and viewport, viewing transformations

Line Clipping: Cohen sutherland method, midpoint subdivision method

Unit – VI	Graphic Design Fundamentals	2 Hours

Fundamentals of graphic design: color theory, imagery, typography, and composition.

Internal Continuous Assessment (ICA):

ICA consists of minimum 8 practical based on curriculum

Text Books

1. Computer Graphics - Donald Hearn, Baker (second edition) PHI publications.
2. Edward Angel, Dave Shreiner,Interactive Computer Graphics, A Top-Down Approach WithShader-Based OPENGL,6th Edition, Pearson Education.
3. Procedural elements for Computer Graphics - David F. Rogers (second edition) Tata McGraw Hill Publication.

4. Mathematical elements for Computer Graphics- Rogers, Adams (second edition) McGraw Hill Publishing Company.

Reference Books

1. John F. Hughes, Andries Van Dam, MORGAN MCGUIRE, 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

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-III

24GEU3O44T: OPEN ELECTIVE I
STATISTICS AND FUZZY LOGIC

Teaching Scheme			Examination Scheme	
Lectures	2 Hours/week		ESE	60 Marks
Tutorial	1 Hours/week		ISE	40 Marks
Credits	3		ICA	25 Marks

Introduction:

This course introduces basic and advanced topics of statistics which are useful in data analysis. This course introduces numerical methods (Unlike analytical methods) to solve simultaneous systems of linear equations. This course also introduces the fuzzy set theory in brief which deals with characterizing the concept of uncertainty and its relationship to the increasingly important concept of information and complexity. It also includes optimization techniques like simplex method and assignment problems.

Course Prerequisite:

Elementary set theory, Basics of statistics and Elementary transformations in matrices.

Course Objectives:

1. To introduce to student's the basic and advanced concepts of statistics.
2. To introduce to student's various numerical methods to solve the system of linear simultaneous equations.
3. To introduce to student's comprehensive coverage of fuzzy sets.
4. To enable students to solve Linear Programming Problems and Assignment Problems.

Course Outcomes:

After completing the course, students will be able to
1. Apply the basic concepts of statistics to interpret the variability of data.
2. Develop the relation between two variables for the given data using regression and fitting the curves for the given data.
3. Solve the system of linear simultaneous equations arising in Machine learning and Data science.
4. Solve optimization problems of real life using Simplex method and Assignment Problems.
5. Understand the concept of fuzzy sets and its applicability to engineering.

Unit – I	Introduction to Statistics	6 Hours

Measures of central tendency, Measures of dispersion, Coefficient of variation, Central Moments, Skewness and Kurtosis.

Unit – II	Descriptive Statistics	6 Hours

Coefficient of correlation by Karl Pearson's method and lines of regression of bivariate data. Curve fitting by Least square principle (straight line, second degree parabola and exponential curves).

Unit – III	Numerical solutions to system of linear simultaneous equations	6 Hours

Basic concepts of set theory, types of operations on sets, ordered pairs, Cartesian product.

Unit – IV	LPP and Assignment Problems	6 Hours

Introduction to LPP, Simplex method for LPP, Assignment problem: Introduction mathematical formulation of Assignment Problems, Hungerian method to solve Assignment Problems.

Unit – V	Introduction to fuzzy sets	6 Hours

Crisp sets, Basic types of fuzzy sets, Basic concepts of fuzzy sets, Fuzzy sets vs Crisp sets, α−cut, Strong α−cut, Additional properties of α−cuts, representation of fuzzy sets and extension principle of fuzzy sets.

Internal Continuous Assessment (ICA):

ICA shall consist of a minimum of five assignments / tutorials based on the above syllabus.

Text Books

1. Textbook of Engineering Mathematics by N.P. Bali, Manish Goyal, Laxmi Publications, New Delhi.
2. Advanced Engineering Mathematics, Kreyzig-John Wiley & SMS, New York.
3. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill.
4. Numerical Methods in Engineering and Science by B. S. Grewal, Khanna Publication, Delhi.
5. George J Klir and BoYuan, Fuzzy sets and Fuzzy logic– PHI India.

Reference Books

1. Advanced Engineering Mathematics, Peter O'Neil, Cengage Learning.
2. Pundir & Pundir, Fuzzy sets and their applications – Pragati Publications.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-III

24CMU3EM5T: ENTERPRENEURSHIP DEVELOPMENT

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

Introduction:

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

Course Prerequisite:

No special prerequisite for this course

Course Objectives:

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

Course Outcomes:

After completing the course, students will be able to
1. Identify various characteristics of entrepreneurs & also various types of entrepreneurs.
2. Analyze the significance of Entrepreneurship Development Programmes (EDPs), their structure, phases, and the challenges faced in their implementation.
3. Demonstrate the ability to 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, social

entrepreneur, qualities of entrepreneurs, types of entrepreneurs.

Unit – II	Entrepreneurship Development	4 Hours

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

Unit – III	Entrepreneurial Project Development	4 Hours

Idea generation–sources and methods, preparation of a project report/ business plan including: market plan, financial plan, operational plan, HR plan, working capital management, break even analysis etc.

Unit – IV	Small-Medium Enterprises and Support Systems	3 Hours

Meaning and definition of Micro, Small & Medium Enterprises, forms of business ownership, Funding options available, role of government organization to support business.

Internal Continuous Assessment (ICA):

Students of a batch should be divided into groups (consisting of maximum five members) to carry out the following tasks:

1. Two case studies on successful entrepreneurs

2. Two case studies on failure of businesses

3. Idea generation & selection of an idea for business

4. Preparation of project report / business plan for starting a small unit and presentation on the same.

Text Books

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

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

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-III

24CMU3VE7T: UNIVERSAL HUMAN VALUES

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

Introduction:

The salient features of this course are:

1.It presents a universal approach to value education by developing the right understanding of reality (i.e. a worldview of the reality "as it is") through the process of self-exploration.

2.The whole course is presented in the form of a dialogue whereby a set of proposals about various aspects of the reality are presented and the students are encouraged to self-explore the proposals by verifying them on the basis of their natural acceptance within oneself and validate experientially in living.

3.The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information.

4.While introducing the holistic worldview and its implications, a critical appraisal of the prevailing notions is also made to enable the students discern the difference on their own right.

Course Prerequisite:

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

Course Objectives:

This introductory course input is intended:
1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards valuebased 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 Outcomes:

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	7 Hours

Need, Basic Guidelines, Content and Process for Value Education:

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 fulfillment 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 fulfill the above human aspirations understanding and living in harmony at various levels.

Unit – II	Understanding Harmony in the Human Being	7 Hours

Harmony in Myself

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	8 Hours

Harmony in Human Relationship

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 fulfillment 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	8 Hours

Whole existence as Coexistence

1. Understanding the harmony in the Nature

2. Interconnectedness and mutual fulfillment 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

Internal Continuous Assessment (ICA):

Text Books

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

Reference Books

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted2008.
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. SubhasPalekar, 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.

e-Resources

1. Value Education websites, http://uhv.ac.in,http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story
6. Gandhi A., Right Here Right Now, Cyclewala Productions
7. AICTE On-line Workshop on Universal Human Values Refresher Course-I Handouts
8. UHV-I handouts
   https://drive.google.com/drive/folders/16eOka8AoBpLGlCDajRvk4MXgfXQWzFCB?usp=sharing
9. UHV-II handouts
   https://drive.google.com/drive/folders/15eHkMVguzRBDrb65GFi7jMN6UEP5JEk1?usp=sharing

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-III

24ITU3CC8P: OBJECT ORIENTED PROGRAMMING USING JAVA

Teaching Scheme			Examination Scheme	
Lectures	1 Hours/week		**ESE**	-
Practical	2 Hours/week		**ISE**	25 Marks
Credits	2		**ICA**	25 Marks
			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 Prerequisite:
Students should have prior knowledge of Object-Oriented Programming.

Course Objectives:
1. To introduce the basics of Object-Oriented Programming paradigm.
2. To introduce the core components of Java programming language.
3. To introduce the necessary concepts of exception handling, multithreading and collection classes.
4. To study Java APIs to write and debug applications using Java.

Course Outcomes:
After completing the course, students will be able to
1. Implement Object Oriented Programming paradigm using Java language.
2. Exhibit the ability to use Java runtime library APIs to provide a solution to a given problem.
3. Implement the concepts of exception handling, multithreading and collection classes.
4. Debug a Java program for a given problem.

Unit – I	**Basics of Java and Strings in Java**	**2 Hours**
Basics: Java Runtime Environment (Oracle JDK, OpenJDK), Naming Conventions, Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input and Output, Data Types, Arrays, Type Casting, String, StringBuffer and StringBuilder Classes in Java.		

Unit – II	**Classes, Objects and Methods**	**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, Nested class, Inner class, Anonymous inner class, Abstract class, Wrapper classes, Object Life time & Garbage Collection.

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, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Understanding of Java Object Class, Comparison between abstract class and interface.

Unit – IV	Exceptions and Error Handling	2 Hours

Exceptions and Errors, Catching and Handling Exceptions, the try Block, the catch Blocks, the finally Block, Throwing 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 Package	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.

Internal Continuous Assessment (ICA):

ISE Evaluation: ISE Evaluation for the course will consist of three programming (hands- on) tests.

1. ICA shall consist of minimum 10 to 12 practical assignment problems.
2. 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.
3. 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

1. Head First Java, Kathy Sierra, Bert Bates, O'Reilly Publication.
2. The JavaTM Programming Language, Ken Arnold, James Gosling, David Holmes, Pearson Publication.
3. Core Java for Beginners, Rashmi Kanta Das, Vikas Publishing House Pvt. Ltd.
4. Programming with Java, Balaguruswamy, TMH.

5. Internet and Java Programming, Tanweer Alam, Khanna Publishing House.

Reference Books

1. The Java Language Specification, Java SE 8 Edition Book by James Gosling, Oracle Inc.
2. Java: The Complete Reference 8 Edition - Herbert Schildt, Tata McGraw - Hill Education
3. The JavaTM Tutorials. Oracle Inc.

e-Resources

1. http://docs.oracle.com/javase/specs/
2. http://docs.oracle.com/javase/tutorial/

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-III

24ITU3FP9L: COMMUNITY ENGAGEMENT PROJECT/ FIELD PROJECT

Teaching Scheme		Examination Scheme	
Lectures	-	**ESE**	-
Practical	4 Hours/week	**ISE**	-
Credits	2	**ICA**	50 Marks

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 Prerequisite:

The primary prerequisite for a Community Engagement Project (CEP) or Field Project is a willingness to learn and engage with the community, along with a basic understanding of community development principles. Specifically, students should be prepared to actively participate in community needs assessments, project planning, and implementation, while also being sensitive to cultural contexts.

Course Objectives:

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

Course Outcomes:

After completing the course, students will 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.

• Analysis of the collected data should be done.

• A solution should be proposed to the problem identified.

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

Internal Continuous Assessment (ICA):

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-IV

24ITU4CC1T: THEORY OF COMPUTATION

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/week	**ESE**	60 Marks
Tutorial	1 Hours/week	**ISE**	40 Marks
Credits	3	**ICA**	25 Marks

Introduction:

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

Course Prerequisite:

Students should have prior knowledge of Discrete Mathematical Structure.

Course Objectives:

1. To introduce the computational principles to build regular expressions for 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:

After completing the course, students will be able to
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	4 Hours

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

Unit – II	Finite Automata	5 Hours

Finite automata definition and representation, Non-deterministic F.A., NFA with^ transitions,

Equivalence of DFA & NFA		
Unit – III	**Kleen's Theorem**	**4 Hours**
Statements & proofs, minimizing number of states in an FA, Basics of Moore and Mealy Machines		
Unit – IV	**Grammars & Languages**	**5 Hours**
Definition and types of grammars and languages, derivation trees and ambiguity, CNF notations, Union, Concatenation and*'s of CFLs, eliminating ^ production and unit productions from a CFG, Eliminating useless variables from a Context Free Grammar.		
Unit – V	**Pushdown Automata**	**4 Hours**
Definition, deterministic PDA & types of acceptance.		
Unit – VI	**6 CFL's & Non CFL's**	**4 Hours**
Pumping Lemma & examples,		
Unit – VII	**Turing machines**	**4 Hours**
Models of computation, definition of TM as language Acceptors,		
Internal Continuous Assessment (ICA): 1. Regular Expression & Corresponding Languages 2. Union, Intersection & Complements of Regular languages 3. Design & Simulation of Simple Finite Automata 4. Nondeterministic Finite Automata & NFA with ^transitions, Conversion of NFA to DFA 5. Draw NFA using Kleens theorem 6. DFA minimization 7. Grammar, Removing ambiguity from a grammar, Conversion to BNF & CNF form 8. Push Down Automata 9. Pumping Lemma & Examples for regular sets & regular languages 10. Turing Machine		

Text Books

1. Introduction to languages & theory of computation--John C.Martin(MGH)
2. Formal Languages & Automata Theory-- Basavraj S. Anami, Karibasappa K.G., Wiley Precise Textbook-Wiley India

Reference Books

1. Theory of Computation—Rajesh K Shukla (CENGAGE Learning)
2. Introduction to Automata theory, languages and computations – John E. Hopcraft, Rajeev Motwani, Jeffrey D. Ullman (Pearson Edition).
3. Discrete mathematical structures with applications to Computer science - J.P.Tremblay & R.Manohar (MGH)
4. Theory of Computer Science:Automata, Languages and Computation, Mishra, Phi
5. Theory of Computation, R B Patel & Prem Nath, Khanna Publications

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester- IV

24ITU4CC2T: MICROPROCESSORS 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 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. Describe the architecture of 8086 microprocessor.
2. Write an 8086-assembly language program.
3. Simulate associative cache memory and direct mapped cache memory.
4. Compare different types of 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.

Unit – III	Interrupts and DMA	6 Hours

Basic Interrupt Processing, Hardware Interrupts, 8259 -Programmable Interrupt Controller, Block diagram of DMA Controller (IC 8257)

Unit – IV	Memory Hierarchy Design	7 Hours

Introduction, Eleven Advanced Optimization of Cache Performance, RAM Cell, Associative Cache, Direct Mapped Cache.

Unit – V	Instruction Level Parallelism	7 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

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

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

1. The Intel Microprocessors: Architecture, Programming & Interfacing PHI- Barry   B.Brey(Unit
2. Computer Architecture, A Quantitative Approach, John L. Hennessey and David A. Patterson: 4th Edition, Elsevier (Unit 4, 5).
3. AK Ray & K M Bhurchandi―Advanced Microprocessors and Peripherals.

Reference Books

1. Liu & Gibson-Microcomputer System 8086 /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. (Information Technology), Semester- IV

24ITU4CC3T: 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
		POE	25 Marks

Introduction:

This course introduces Computer Networks, network-layered architecture, and communication protocols. The course includes the implementation of socket programming and the simulation of network protocols.

Course Prerequisite:

This course requires prior knowledge of any basic C programming language.

Course Objectives:

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

Course Outcomes:

After completing the course, students will be able to
1. Demonstrate the basics of the network and apply framing, error, and flow control techniques
2. Evaluate various networking protocols used in the Internet protocol
3. Select and use appropriate application layer protocols for a given problem.
4. Design a network with subnets using the different classless & classes of IP addresses

Unit – I	Introduction to Computer Networks and Internet	4 Hours

Physical Mediums, Concept of Network Protocols, OSI, and TCP/IP Layered Architecture.

Unit – II	Data Link Layer	7 Hours

DLL design issues, error detection, correction, elementary DLL protocols, sliding window protocols, multiple access protocol CSMA, CSMA/CD, and comparison of LAN and VLAN.

Unit – III	Network Layer	7 Hours
Classful addressing, Netmask, Subnet, CIDR, Subnetting Problems, Router Functions, NAT.		
Unit – IV	Transport Layer	7 Hours
User Datagram, UDP Services, TCP Services, TCP Features Socket Interface: Server, Client, Concurrency, Socket, Socket System Calls, Connectionless Iterative Server and Connection-oriented Concurrent Server.		
Unit – V	Application Layer	5 Hours
Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS), File Transfer Protocol (FTP), TELNET, SSH. HTTP, Electronic mail, IMAP, POP		

Internal Continuous Assessment (ICA):

1. Study the basics Linux/Unix Commands with Examples and Syntax.

2. Study of basic network configuration Commands with Examples and Syntax.

3. Study different types of Network cables and practically implement the cross-wired cable and straight-through cable using a clamping tool.

4. Study of Network Devices in Detail.

5. Study of network IP.

6. Connect the computers in the Local Area Network.

7. Examining Network Address Translation (NAT)

8. Simulation of framing methods using C programming (Count, bit and byte method)).

9. Write a program for detecting and correcting errors in the Hamming Code.

10. Simulation of CRC using C programming

11. Write a C program simulation of the Sliding Window Protocol.

12. Write a C program for displaying the class of an IP address, Net id and host id.

13. Implement the client-server C program to display the current date and time.

14. Implementation of a Simple Network Chatting Application using TCP

15. Implementation of C program for Connection-oriented Concurrent Server

16. Design a network & subnetwork and draw a network diagram for any real example.

Text Books

1. Behrouz A. Forouzan, Firouz Mosharraf, Computer Networks: A Top-Down Approach, Tata McGraw-Hill Education Pvt. Ltd
2. A S Tanenbaum, "Computer Networks", Pearson Education
3. J.F. Kurose and K. W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet," Pearson

Reference Books

1. Larry Peterson Bruce Davie, Computer Networks A Systems Approach, Elsevier.
2. Kevin R. Fall, W. Richard Stevens, TCP/IP Illustrated, Volume 1: The Protocols, Pearson.
3. Behrouz Forouzan, Data Communications and Networking, Tata McGraw-Hill.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester- IV

24ITU4CC4T: MATHEMATICAL FOUNDATIONS FOR AI/ML and DATA SCIENCE

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

Introduction:

AI/ML and 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 introduces the fundamentals of mathematics which are used by scientists to solve the real time problems.

Course Prerequisite:

Basics of Linear algebra, Probability, Statistics

Course Objectives:

The primary objective of a "Mathematical Foundations for AI/ML and Data Science" course is to equip students with the necessary mathematical tools and concepts to understand, develop, and apply AI/ML and data science algorithms and models. This includes building a strong foundation in linear algebra, calculus, and probability theory, as well as understanding their applications in machine learning and data analysis.

Course Outcomes:

After completing the course, students will be able to
1. Use the properties of Linear Maps in solving problems on Linear Algebra.
2. Build a strong statistical foundation and learn how to insights from a huge population using a small sample.
3. Demonstrate various random variables, discrete and continuous distributions and their usage.
4. Use optimization techniques and formulate hypotheses for a population to solve real-life business problems.

Unit – I	Linear Algebra	7 Hours

Vectors, Matrices and their properties (determinants, traces, rank, nullity, etc.); Eigen values and eigenvectors; Matrix factorizations; Inner products; Distance measures; Projections; Notion of hyper planes; half-planes.

Unit – II	Multivariate Calculus	8 Hours

Introduction to Derivatives, Basics of Integration, Gradients, Gradient Visualization, Optimization.		
Unit – III	**Statistics**	**7 Hours**

Describing a Single Set of Data, Central Tendencies, Dispersion, Correlation, Simpson"s Paradox, Correlation &causation.

Unit – IV	**Probability**	**8 Hours**

Intro to Probability Theory, Probability Distributions, Expectation, Variance, and Covariance,

Graphing Probability Distributions, Covariance Matrices, Special Random Variables, Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables Continuous Distributions, The Normal Distribution.

Internal Continuous Assessment (ICA):

ICA should consist of Solving 8- 10 assignments on above units.

Text Books

1. Data Science from Scratch: First Principles with Python, Joel Grus, O'Reilly Media
2. David G. Luenberger (1969), Optimization by Vector Space Methods, John Wiley & Sons(NY).
3. G. Strang (2016). Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition,USA.

Reference Books

1. Bendat, J. S. and A. G. Piersol (2010). Random Data: Analysis and Measurement Procedures, 4th Edition, John Wiley & Sons, Inc., NY, USA.
2. Montgomery, D. C. and G. C. Runger (2011). Applied Statistics and Probability for Engineers, 5th Edition, JohnWiley & Sons, Inc., NY, USA.
3. Cathy O"Neil and Rachel Schutt (2013). Doing Data Science, O"Reilly Media
4. Data Sciences, Jain V.K., Khanna Publishing House, Delhi

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester- IV

24ITU4O65T: CYBER LAWS

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/week	**ESE**	60 Marks
Tutorial	1 Hours/week	**ISE**	40 Marks
Credits	3	**ICA**	25 Marks

Introduction:

This course provides a comprehensive understanding of cybercrime, its impact on the global landscape, and the legal frameworks designed to combat it. Students will explore the Indian IT Act 2008, including its latest amendments, and learn to apply IT laws to various legal issues. Additionally, the course covers key information security standards and their implementation in software design and development.

Course Prerequisite:

Basic knowledge of computer systems and the internet is required. Familiarity with network security principles, legal concepts and prior exposure to software development principles are beneficial but not mandatory.

Course Objectives:

1. To understand and identify different types cybercrime and cyber law
2. To recognized Indian IT Act 2008 and its latest amendments
3. To learn various types of security standards compliances

Course Outcomes:

After completing the course, students will be able to
1. Demonstrate the concept of cybercrime and its effect on outside world
2. Interpret and apply IT law in various legal issues
3. Distinguish different aspects of cyber law
4. Apply Information Security Standards compliance during software design and development

Unit – I	Introduction to Data Structures & Stack	6 Hours

Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes

Unit – II	Cyber offenses & Cybercrime	4 Hours

Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg,

Cyber stalking, Cybercafé and Cybercrimes, Botnets.		
Unit – III	**Tools and Methods Used in Cybercrime**	**6 Hours**
Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)		
Unit – IV	**The Concept of Cyberspace**	**4 Hours**
The Concept of Cyberspace E-Commerce, The Contract Aspects in Cyber Law, The Security Aspect of Cyber Law, The Intellectual Property Aspect in Cyber Law		
Unit – V	**Indian IT Act**	**6 Hours**
Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments		
Unit – VI	**Information Security Standard compliances**	**4 Hours**
SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI.		
Internal Continuous Assessment (ICA): • ICA consists of minimum 8 Tutorial assignment based on curriculum.		

Text Books

1. Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, New Delhi
2. The Indian Cyber Law by Suresh T. Vishwanathan; Bharat Law House New Delhi
3. The Information technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
4. Cyber Law & Cyber Crimes By Advocate Prashant Mali; Snow White Publications, Mumbai

Reference Books

1. Nina Godbole, Information Systems Security, Wiley India, New Delhi
2. Kennetch J. Knapp, Cyber Security &Global Information Assurance Information Science Publishing.
3. William Stallings, Cryptography and Network Security, Pearson Publication
4. Websites for more information is available on : The Information Technology ACT, 2008- TIFR : https://www.tifrh.res.in
5. Website for more information, A Compliance Primer for IT professional:
6. https://www.sans.org/reading-room/whitepapers/compliance/compliance-primer-professionals-33538

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester- IV

24CMU4AE7T: GENERAL PROFICIENCY

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

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:

For general proficiency courses, prerequisites often include foundational knowledge in areas like English (reading, writing, and communication), mathematics, and potentially some basic science or social studies.

Course Objectives:

1. To equip students with the skills required for crafting ATS-friendly resumes tailored to specific job descriptions and to develop their proficiency in writing professional emails by following standard formats and etiquette
2. To familiarize students with the importance of group discussions in the selection process and to develop their ability to participate effectively through appropriate communication, body language, and time management strategies
3. To prepare students for personal interviews by developing their self-introduction skills, enhancing non-verbal communication, and equipping them with effective strategies to confidently handle common and challenging interview questions
4. Enable students to understand and apply the correct format, tone, and language while drafting professional notices, agendas, and minutes of meetings for academic and workplace communication
5. To develop students' awareness of various personality types, traits, and the importance of personal grooming, body language, time management, and professional etiquette for achieving success in academic and professional settings.

Course Outcomes:

After completing the course, students will be able to

1. Design job-specific, ATS-compliant resumes and write clear, concise, and professionally appropriate emails, adhering to best practices and workplace communication norm
2. Participate actively and confidently in group discussions by applying effective communication techniques
3. Understand and apply the correct format, tone, and language while drafting professional notices, agendas, and minutes of meetings for academic and workplace communication.
4. Draft clear, concise, and professionally formatted notices and minutes of meetings, demonstrating an understanding of structure, purpose, and effective communication practices.
5. Recognize different personality types, demonstrate appropriate grooming and body language, manage time effectively, and follow professional etiquette in workplace and social interactions.

Unit – I	Professional Communication	4 Hours

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

Unit – II	Group Discussion (GD) Skills	4 Hours

Role of Group Discussion in selection process, Tips for effective GD participation, Dos and Don'ts of effective group participation. Body language and time management in Group Discussion

Unit – III	Personal Interview Techniques	2 Hours

Self-Introduction, Non-verbal communication: posture, power dressing, eye contact, tone, Common interview questions and strategies for answering them, Handling difficult or unexpected questions.

Unit – IV	Notices, Agendas, and Minutes of Meeting	2 Hours

Writing Notices, Format and layout, Language and tone, Sample notices for meetings, events, seminars, etc. Guidelines for effective 'minutes of meeting' writing, Do's and Don'ts of Minutes of Meeting

Unit – V	Personality Development for Engineering Students	3 Hours

Types of personalities and dealing with them, Personality traits, Personal grooming & Body Language for Success, Personality depiction, Time Management & Discipline, Professional Etiquettes

Internal Continuous Assessment (ICA):

Minimum 10 assignments from the below mentioned list

1. **Resume Creation:** Students will prepare a one-page ATS friendly resume tailored to their Job description.

2. **Email and Letter Writing:** Each student will draft a formal email and a cover letter intended for a job application.

3. **Notice, Agenda and Minutes of Meeting Writing:** Write the Notice, agenda and Minutes of Meeting in a business setting.

4. **Public Speaking:** Just a Minute & Elevator pitch activities.

5. **Self-Grooming Journal:** Students will maintain a grooming and time-management journal for three consecutive days, documenting habits, self-discipline practices, and areas of improvement.

6. **SWOT Analysis of Personality:** Each student will perform a personal SWOT analysis to identify their strengths, weaknesses, opportunities, and threats in the context of personality development and employability.

7. **Mock Group Discussion:** Students will participate in mock GDs on current topics and after GD, performance of participants will be reviewed by peer assessment method

8. **Mock Personal Interviews:** Students will undergo mock HR, simulations in front of peers and instructors, followed by personalized feedback on performance and body language.

9. **Body Language:** Record the responses of students during the interview and instructor will analyze their body language and provide personalized feedback

10. **Grooming and Etiquette Demonstration:** In this session, students will observe and demonstrate proper grooming standards, professional dress code, and social etiquettes suitable for interviews and corporate environments.

11. **Time Management Activity:** Students. will be preparing Vision Board activity where they have to set their long-term goal chronologically.

12. **Leadership and Teamwork Exercise:** Solving and discussing Self and Business Case studies

Text Books

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

Reference Books

1. Soft Skills – K. Alex, S. Chand Publications.
2. Soft Skills: A Textbook for Undergraduates – Ajay R. Tengse, Orient Black Swan.
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. (Information Technology), Semester-IV

24CMU4VE8T: PROFESSIONAL ETHICS

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

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 behaviour in building trust, maintaining credibility, and fostering a positive professional environment.

Course Prerequisite:

Generally, most professional ethics courses do not have strict prerequisites and are open to anyone interested in the topic. However, some courses may assume a basic understanding of business management or specific professional fields like engineering or finance.

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 the course, students 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	4 Hours

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

Unit – II	Engineering Ethics	5 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	4 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	3 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.		
Internal Continuous Assessment (ICA):		

Text Books

1. R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006.
2. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
3. Dr. N. Venkateswaran, Professional Ethics in Engineering, Sree Kamalamani Publications.

Reference Books

1. Charles E. Harris Jr., Michael S. Pritchard and Michael J. Rabins, Engineering Ethics: Concepts and Cases, 4th Edition.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-IV

24ITU4EM9T : BUSINESS ECONOMICS

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

Introduction:

Business economics applies economic principles to business decisions and strategies, helping firms understand market dynamics, optimize resource allocation, and make informed choices. It's essentially the study of how economic factors influence business operations and performance.

Course Prerequisite:

Knowledge about entrepreneurship development, basic Arithmetic.

Course Objectives:

1. To acquaint students with fundamentals of economics and its types
2. To explain to student's various theories of economics such as demand supply, Production and Cost.
3. To introduce students with theories of consumer behavior.

Course Outcomes:

After completing the course, students will be able to
1. Demonstrate the fundamentals of economics and its types.
2. Apply various theories of economics for explaining economic growth.
3. Identify consumer behavior and interpret them.
4. To analyze the impact of market and take appropriate action for its survival.

Unit – I	The Fundamentals of Economics	4 Hours

The Economic Problem-Scarcity and Choice; Nature and Scope- Positive and Normative Economics, Micro and Macro Economics; Central Problems of an Economy; Production Possibility Curve; Opportunity Cost; Working of Economic Systems; Economic Cycles.

Unit – II	Basic Elements of Demand and Supply Demand	4 Hours

Meaning, Demand Schedule, Individual and Market Demand Curve, Determinants of Demand, Law of Demand, Changes in Demand; Supply- Meaning, Supply Schedule, Individual and Market Supply Curve, Determinants of Supply, Law of Supply, Changes in Supply; Equilibrium of Demand and Supply Determination of Equilibrium Price and Quantity, Effect of a shift in Demand or Supply;

Elasticity of Demand and Supply		
Unit – III	**Theory of Consumer Behaviour Cardinal Utility Approach**	**6 Hours**
Law of Diminishing Marginal Utility, Law of Equi-Marginal Utility; Indifference Curve Approach-Indifference Curves, Properties of Indifference Curves, Budget Line, Consumer's Equilibrium.		
Unit – IV	**Theory of Production and Costs Theory of Production**	**6 Hours**
Factors of Production, Basic Concepts, Production Function, Law of Variable Proportions, Returns to Scale; Producer's Equilibrium- Least-Cost Factor Combination and Output Maximization for a given Level of Outlay; Theory of Costs- Basic Concepts, Short-run Total Cost Curves Fixed and Variable, Short-run Average and Marginal Cost Curves, Relationship between Average and Marginal Cost Curve, Average and Marginal Cost Curves in the Long-run.		
Unit – V	**Analysis of Markets Basic Concepts of Revenue**	**6 Hours**
Analysis of Markets Basic Concepts of Revenue, Revenue Curves, Relationship between Average and Marginal Revenue Curve; Concept of Market and Main Forms of Market; Equilibrium of the Firm- Meaning, Objectives of the Firm, Total Revenue-Total Cost Approach, Marginal Revenue-Marginal Cost Approach; Price and Output under Determination Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly.		
Unit – VI	**Indian Economy**	**4 Hours**
An Overview Basic Characteristics of the Indian Economy; Major Issues of Development; Development Experience and Recent Trends in Indian Economy; Indian Economy in Comparison to Major Economies of the World.		
Internal Continuous Assessment (ICA):		

Text Books

1. Samuelson & Nordhaus – Economics (McGraw-Hill): Comprehensive macro and microeconomic analysis.
2. N. Gregory Mankiw – Principles of Economics (Cengage): Beginner-friendly global standard textbook.
3. H.R. Varian – Intermediate Microeconomics (W\. W. Norton): Rigorous microeconomic theory text.

Reference Books

1. Dominick Salvatore – Managerial Economics in a Global Economy (OUP): Global perspective on managerial economics.
2. Keat, Young & Erfle – Managerial Economics (Pearson): Practical decision-making tools with business focus.
3. D.C. Hague – Managerial Economics (Longman): Classical reference for business decision-making.

4. McGuigan, Moyer & Harris – Managerial Economics (Cengage): Strategy-oriented with case-based learning.

e-Resources
NPTEL Managerial Economics IIT Kanpur https://nptel.ac.in/courses/110104068   SWAYAM Managerial Economics Courses https://swayam.gov.in/explorer?category=Economics   Khan Academy Microeconomics https://www.khanacademy.org/economics-finance-domain/microeconomics   Khan Academy Macroeconomics https://www.khanacademy.org/economics-finance-domain/macroeconomics   Coursera Managerial Economics University of California Irvine   https://www.coursera.org/learn/managerial-economics   MIT OpenCourseWare Principles of Microeconomics https://ocw.mit.edu/courses/economics/14-01sc-principles-of-microeconomics-fall-2011   MIT OpenCourseWare Principles of Macroeconomics https://ocw.mit.edu/courses/economics/14-02-principles-of-macroeconomics-spring-2014   YouTube StudyIQ Business Economics Lectures   https://www.youtube.com/results?search_query=business+economics+studyiq   YouTube Unacademy Business Economics   https://www.youtube.com/results?search_query=business+economics+unacademy

24ITU4VE10P : PYTHON PROGRAMMING

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

Introduction:

Python is a popular, general-purpose, multi-paradigm, open-source, scripting language. It is designed to emphasize code readability – has a clean syntax with high level data types. It is suited for interactive work and quick prototyping, while being powerful enough to write large applications. This course introduces the python language which has simple syntax, powerful set of libraries and robust debugger and profiler.

Course Prerequisite:

Student should have knowledge of basic programming.

Course Objectives:

1. To introduce the core components of Python programming language.
2. To study library packages to write applications using python.
3. To handle exceptions and debug python program.

Course Outcomes:

After completing the course, students will be able to
1. Apply procedure-oriented features to provide a solution.
2. Apply Object-oriented features to provide solution.
3. Incorporate standard packages to provide solution to a given problem statement.
4. Handle exceptions and debug python program.

Unit – I	Python programming constructs	5 Hours

Introducing the Python Interpreter, Data types and variables, Collection data types, String handling, Control structures, loops, functions, Lambdas, Generators, recursion, Scope of variables, Shallow and deep copy operations, Built-in: Functions, Constants, Types.

Unit – II	Introduction to Object Oriented Programming in Python	4 Hours

Classes, Instance Objects, Method Objects, Class and Instance Variables, Attributes and methods, Inheritance and polymorphism.

Unit – III	Python Standard Library Modules and Packages	4 Hours

Regular expression operations, Basic date and time types, General calendar-related functions, Container data types, NumPy, Mathematical functions, Generate pseudo-random numbers, File and Directory Access.

Data Persistence: CSV File Reading and Writing, Configuration file parser, Logging facility for Python.

Unit – IV	Exception Handling	2 Hours

Handling Multiple exceptions, creating custom exceptions, Debugging.

Internal Continuous Assessment (ICA):

ICA consists of minimum 8 practical based on curriculum.

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, MarkLutz, 5th edition.
3. Programming Python (English), MarkLutz, 4th Edition.
4. Testing Python, David Sale, Wiley India (P) Ltd., ISBN :978-81-265-5277-1.

e-Resources

1. Python documentation - https://docs.python.org/3/

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(An Autonomous Institute)

Second Year B.Tech. (Information Technology), Semester-IV

24CMU4MC2T: ENVIRMENTAL STUDIES

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

Introduction:

The need of sustainable development is a key to the future mankind. continuing the problems of all types of pollutions, loss of forest, solid waste disposal, degradation of environment, issues like economic productivity and national security, global warming, ozone layer depletion and loss of biodiversity have made everyone aware of environmental issues. No citizen of the earth affords to be ignorant of environmental issues. Environmental management has captured the attention of health care managers. Managing environmental hazard has becomes very important. It is now more critical than ever before for mankind as a whole to have clear understanding of environmental concerns and to follow sustainable development practices. Destructions of habitats, over-use of energy resources and environmental pollution have been found to be responsible for the loss of a large number of life-forms. It is feared that a large proportion of life are which may get wiped out in the near future.

Course Prerequisite:

This course requires knowledge of surroundings, resources, ecosystem, biodiversity and pollution.

Course Objectives:

1. Recognize & understand major concepts in Environmental studies & demonstrate in depth understanding of environment.
2. Understand the interdisciplinary approach to complex Environmental problems using basic tools of the natural & social sciences including Biology, Chemistry, Physics, Economics, Political sciences, Laws, Electronics etc.
3. Develop analytical skills, ability to critically evaluate the science & policy ramifications of diverse energy portfolios on air, water & food quality climate, forests etc.

Course Outcomes:

After completing the course, students will be able to
1. Describe the natural environment and its relationships with human activities.
2. Explain the ethical means and technological methods for sustainable management of environmental systems.
3. Explain social, economic and legal policies involved in the resolution of environmental problems.

Unit – I	Nature of Environmental studies	2 Hours

Definition, scope and importance. Multidisciplinary nature of environmental studies, Need for public awareness.

Unit – II	Natural resources and associated problems	3 Hours

a) Forest, resources, use and over-exploration, disforestation, timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources, Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam 's benefits and problems.

c) Mineral resources. And usage and exploitation, environmental effects of extracting and using mineral resources.

d) Food resources, world food problem, changes caused by agriculture effects of modern agriculture, fertilizer-pesticide problems.

e) Energy resources, growing energy needs renewable and non-renewable energy sources, use of alternate energy sources.

f) Land resources, land as a resource, land degradation man induced landslides, soilerosion and decertification.

g) Role of an individuals in conservation of natural resources.

h) Equitable use of resources for sustainable lifestyle.

Unit – III	Ecosystems	2 Hours

Concept of an ecosystem

a) Structure and function of an ecosystem.

b) Producers, consumers and decomposers.

c) Energy flow in the ecosystem.

d) Ecological succession.

e) Food chains, food webs and ecological pyramids Introduction types, Characteristics features, structure and function of the ecosystem.

    I. Forest ecosystem.

   II. Grassland ecosystem.

  III. Desert ecosystem.

  IV. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit – IV	Biodiversity and its conservations	2 Hours

a) Introduction-Definition, genetic, species and ecosystem diversity.

b) Biogeographically classification of India.

c) Value of biodiversity consumptive use, productive use, social, ethical aesthetic and option values.

d) Biodiversity at global, national and local levels.

e) India as a mega-diversity nation.

f) Western Chat as a bio-diversity region.

g) Hot –spot of biodiversity.

h) Threats of biodiversity, habitual loss, poaching of wildlife, man wildlife conflicts.

i) Endangered and endemic, species of India.

j) Conservation of biodiversity, in-situ and Ex-situ conservation of biodiversity.

Unit – V	Environmental Pollutions	2 Hours

Definitions: - Causes, effects and control measures of

a) Air Pollution

b) Water pollution

c) Soil Pollution

d) Marine pollution

e) Noise pollution

f) Thermal pollution

g) Near hazards

h) Solid waste Management, causes effects and control measures of urban and Industrial wastes

i) Role of an individual in presentation of pollution

j) Pollution case studies

k) Disaster management: Floods, earthquake, cyclone and landslides, Tsunami

Unit – VI	Social issues and the Environment	2 Hours

a) From Unsustainable to Sustainable development

b) Urban problems related to energy

c) Water conservation, rain water harvesting, watershed management

d) Resettlement and rehabilitation of people, its problems and concerns

e) Environmental ethics, issue and possible solutions

f) Climate change, Global warming, acid rain, Ozone layer depletion, nuclear accidents and holocaust.

g) Consumerism and waste products

Unit – VII	Environmental Protection	2 Hours

a) Environment Protection act
b) Air (prevention and control of Pollution act)
c) Water (prevention and control of Pollution act)
d) Wildlife Protection act
e) Population growth and human health, human rights

Internal Continuous Assessment (ICA):

Reference Books

1. Erach Bharucha (2013): Text book of Environmental Studies for under graduate courses, second Edition (2013).
2. P.S Verna and V.K.Agarwal, 1983. Environmental biology, S. Chand Publications, NewDelhi.
3. https://www.google.co.in/images
4. https://envfor.nic.in/legis/legis.html
5. Dr Prakash Sawant(2009) ―Environment studies‖ Fadake Publisher Kolhapur
6. Dr S. D Kadam (2005) ―Human, Environment and Pollution‖Fadake PublisherKolhapur
7. Environment studies- University Press, Solapur University,Solapur
8. ErachBharucho-―Environmental Studies‖ UGE Press NewDelhi
9. Dr J S Samant (2005)-―Environmental Studies‖ Shivaji University press
10. Bharucha, E. (2004): Textbook for environmental studies for undergraduate students of all branches of higher education. University Grants Commission (UGC), New Delhi pp 249- 286.