WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University,
Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus
for
S. Y. B.Tech. Computer Science & Engineering

W.E.F. 2023-24

Walchand Institute of Technology, Solapur

Structure of S.Y. B.Tech. Computer Science & Engineering,

(W.E.F. 2023-2024)

Semester– III

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
22CSU3BS1T	Applied Mathematics-I	3			3	60	40		100
22CSU3BS1A	Applied Mathematics-I Tutorial		1		1			25	25
22CSU3CC2T	Discrete Mathematical Structures	3			3	60	40		100
22CSU3CC2A	Discrete Mathematical Structures Tutorial		1		1			25	25
22CSU3CC3T	Data Structures	3			3	60	40		100
22CSU3CC3L	Data Structures Lab			2	1	50		25	75
22CSU3CC4T	Computer Graphics	3			3	60	40		100
22CSU3CC4L	Computer Graphics Lab			2	1			25	25
22CSU3CC5P	Python Programming	2		2	3	50	25	25	100
22CEU3HU6T	Universal Human Values	3			3	60	40		100
	Total	**17**	**2**	**6**	**22**	**400**	**225**	**125**	**750**

Walchand Institute of Technology, Solapur

Structure of S.Y. B.Tech. Computer Science & Engineering,

(W.E.F. 2023-2024)

Semester– IV

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
22CSU4BS1T	Applied Mathematics-II	3			3	60	40		100
22CSU4BS1A	Applied Mathematics-II Tutorial		1		1			25	25
22CSU4CC2T	Theory of Computation	3			3	60	40		100
22CSU4CC2A	Theory of Computation Tutorial		1		1			25	25
22CSU4CC3T	Microprocessors and Computer Architecture	3			3	60	40		100
22CSU4CC3L	Microprocessors and Computer Architecture Lab			2	1			25	25
22CSU4CC4T	Computer Networks	3			3	60	40		100
22CSU4CC4L	Computer Networks Lab			2	1	50		25	75
22CSU4CC5P	Object Oriented Programming Using JAVA	2		2	3	50	25	25	100
	Total	**14**	**2**	**6**	**19**	**340**	**185**	**125**	**650**

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

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
22GEU4MC2T	Environmental studies	1	--	--	1	50	-	-	50

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
Second Year B.Tech (Computer Science & Engineering) Semester-III
22CSU3BS1T : APPLIED MATHEMATICS-I

Teaching Scheme:	**Examination Scheme**
Lectures-3 Hours/week, 3 Credits	ESE-60 Marks
Tutorial- 1 Hour/ week,1 Credit	ISE -40 Marks
	ICA-25 Marks

Introduction:
This course includes mathematical theory and concepts required by the computer engineer. The course consists of linear differential equations which can be used for a mathematical model which are appearing in computer engineering, where these variables are dynamically related. This course introduces Z- transform which provide a mathematical framework for a series of mathematical conversions that are useful for digital filters. Laplace transforms is another powerful mathematical tool for engineering problems in Computer Science and Engineering.. This course also introduces fundamentals of probability distributions which are useful for digital communication. This course introduces Queuing systems which are prevalent throughout society.

Course Prerequisite:
Fundamentals of trigonometry, method of finding roots of algebraic equations, differentiation, integration, partial fraction, the sum of sequence and methods of solving definite integrations, basics of statistics, and probability theory.

Course Objectives:
1. To introduce to student method of solving higher order linear differential equations
2. To introduce to student Laplace and inverse Laplace transforms
3. To make student understand Z transform and its properties
4. To introduce to student various probability distributions

Course Outcomes:
On completion of course students will be able to -
1. Solve linear differential equations, essential in modeling and design of computer-based systems.
2. Apply Laplace and inverse Laplace transforms for solving linear differential equations.
3. Apply concept of Z transform and its applications to discrete and continuous systems and image processing.
4. Apply statistical methods for data analysis.
5. Apply probability and probability distributions in predictions in machine learning.

SECTION – I

Unit 1: Linear differential equations with constant coefficients (08)
Basic definition, differential operator, complimentary functions, particular integral,Shortcut methods for standard functions like e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$, x^m, $e^{ax}VandxV$, particular integral by general method (without method of variation of parameters) for other functions.

Unit 2: Laplace transform **(07)**

Definition, Laplace transform of standard functions, properties- first shifting, change of scale, multiplication of power t and division by t, Laplace transform of derivative and integral, Laplace transform of periodic functions, unit step functions and unit impulse functions.

Unit 3: Inverse Laplace transform **(06)**

Definition, inverse Laplace transform of standard functions, Properties of inverse Laplace transforms: linearity property, first shifting theorem, partial fraction, inverse transform of logarithmic &inverse trigonometric functions and convolution theorem, solution of differential equations by Laplace transform.

SECTION-II

Unit 4: Z-Transform **(07)**

Introduction, Z-Transform of standard sequence, properties of Z-transform – linearity, change of scale, shifting property, multiplication by k, division by k, inverse Z-transform –power series method, partial fraction method.

Unit 5: Statistics **(07)**

Coefficient of correlation by Karl Pearson's method, lines of regression of bivariate data, rank correlation coefficient, fitting straight line and parabola by least square principle.

Unit 6: Probability & Probability distribution **(07)**

Probability, theorems on probability, Bayes theorem, random variable, discrete and continuous random variable, probability density function, Binomial, Poisson, Normal distribution.

Internal Continuous Assessment(ICA):

ICA shall consist of minimum six to eight assignments based on entire curriculum

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Text books:

1. A textbook of Applied Mathematics Vol. II and Vol. III, J.N. and P.N. Wartikar, Vidyarthi Grah Prakashan, Pune.
2. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publications, Delhi.
3. A Textbook of Applied Mathematics, N.P. Bali, Ashok Saxena and N.Ch. S.N.Iyengar, Laxmi Publications, Delhi.
4. Advanced Engineering Mathematics, Kreyzig-JohnWiley&SMS, NewYork.

Reference Books:

1. Advanced Engineering Mathematics, Peter O'Neil, Cengage Learning.
2. Engineering Mathematics, Srimanta Pal, Subodh Chandra Bhunia, Oxford University Press

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
Second Year B.Tech (Computer Science & Engineering), Semester-III
22CSU3CC2T : DISCRETE MATHEMATICAL STRUCTURES

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week,3 Credits	ESE –60 Marks
Tutorial–1 Hour/week,1 Credits	ISE – 40 Marks
	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:

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

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SECTION-I

UNIT-1 Mathematical logic **(06)**

Introduction, statements and Notation, Connectives-negation, conjunction, disjunction, conditional, bi conditional, statement formulas and truth tables, well-formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives.

UNIT-2 Representation of expressions **(04)**

Normal & Principle normal forms, completely parenthesized infix & polish notations, Theory of inference for statement calculus.

UNIT-3 Set theory **(04)**

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

UNIT-4 Relations **(07)**

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

SECTION II

UNIT-5 Functions **(04)**

Function-types, Composition of functions, Inverse functions.

UNIT-6 Algebraic systems **(07)**

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

UNIT-7 Groups **(06)**

Polish expressions and their compilation, Groups, group codes.

UNIT-8 Lattices and Boolean algebra **(07)**

Lattice as POSETs, definition, examples and Properties, Special Lattices, Boolean algebra definition and examples, Boolean functions.

Internal Continuous Assessment (ICA) :

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

Text books:

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 (CENGAGE Learning)

Reference Books:

1. Discrete Mathematical Structures –Bernard Kolman, Robert C. Busby (Pearson Education)
2. Discrete mathematics-Liu (MGH)
3. Theory and problems in Abstract algebra--Schaums outline series (MGH)
4. Discrete Mathematical Structures-Y N Singh (WILEY)
5. Discrete Mathematics and Its Applications, Chakraborty & Sarkar, Oxford
6. Discrete Structures, S.B.Singh, Khanna Book Publishing, Delhi
7. Discrete Mathematics, T.Veerarajan, TataMcGraw-Hill

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
Second Year B.Tech (Computer Science & Engineering) Semester-III
22CSU3CC3T : DATA STRUCTURES

Teaching Scheme	**Examination Scheme**
Lectures:3 Hrs/Week,3 Credits	ESE:60 Marks
Practical:2 Hrs/Week,1 Credits	ISE:40 Marks
	ICA:25 Marks
	POE: 50 Marks

Introduction:

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

Course prerequisites:

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 Outcome:

Students will be able to

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

UNIT 1: Introduction to Data Structures & Stack (07)

What is Data Structure, types of data structures – static, dynamic, primitive, non-primitive, linear, non-linear.

Stack: Definition, representation, operations, implementation, applications like conversion of polish notations, evaluation of postfix expressions.

UNIT 2: Queues (05)

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

UNIT 3: Lists **(08)**

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.

SECTION –II

UNIT 4: Trees **(09)**

Definition, traversal, linked implementation, operations on Binary Trees and Binary Search Trees, Introduction to Threaded Binary Trees, Multiway Trees, B trees, B+ trees.

UNIT 5: Height Balanced Trees **(06)**

AVL Trees: Definition, height of an AVL Tree, insertion, deletion of node in AVL Trees, Single andDouble rotation of AVL Trees.

UNIT 6: Graphs **(07)**

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 minimum 15 practical assignment problems based on all above topics in line withcourse outcome. Practical problem statements should cover all topics mentioned in syllabus.

Text Books:

1. Data Structure 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

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Reference Books:

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

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
Second Year B.Tech. (Computer Science & Engineering), Semester-III
22CSU3CC4T : COMPUTER GRAPHICS

Teaching Scheme	**Examination Scheme**
Lectures:3 Hrs/week,3 credits	ESE: 60 Marks
Practical:2 Hrs/Week,1 credit	ISE: 40 Marks
	ICA: 25 Marks

Introduction :

This course introduces the basics of computer graphics and different basic graphics functions. It also elaborates the concepts of 2D and 3D computer graphics. In this course, topics include geometric modeling, 3D viewing and projection, lighting and shading, color, and the use of one or more technologies and packages such as OpenGL.

Course Objectives:

1. To introduce basics elements of computer graphics and demonstrate the line, circle and polygon filling algorithms for creating graphical figure.
2. To demonstrate 2D and 3D transformations.
3. To introduce clipping algorithms, hidden & visible surfaces and different types of curves.

Course Outcome:

1. To define the fundamentals of computer graphics& use of various functions for generating and rendering graphical figures.
2. Apply 2D/3D transformations to a given object and create 2D/3D animations.
3. Demonstrate different clipping algorithms, surfaces and different types of curves.

SECTION-I

UNIT-1 Basic Concepts & Raster scan Graphics (08)

Introduction, Application areas of Computer Graphics, Raster scan display, Random scan display. Output Primitives: Points and lines, Line drawing algorithms: DDA, Bresenham's algorithm, Bresenham's Circle generation algorithm. Polygon and polygon filling algorithms

UNIT-2 Introduction to Light and Color Modelling (08)

Introduction to Object-Rendering, Light Modeling Techniques, illumination Model, Shading, Flat Shading, Polygon Mesh Shading, Transparency Effect, Shadows, Texture and Object Representation, Color Models.

UNIT-3 2D Geometric Transformations (06)

2D Transformation: Translation, Rotation, Reflection, Scaling, Shearing, Combined transformation, Rotation about an arbitrary point, Reflection through an arbitrary line.

SECTION-II

UNIT-4 3D Geometric Transformations (06)

3D Transformation: Scaling, Shearing, Rotation, Reflection, Translation, Multiple Transformation, Rotation about axis parallel to coordinate axis.

UNIT-5 2D Viewing and 3D Viewing (09)

Introduction to Viewing transformation, Sutherland-Cohen line clipping algorithm, Midpoint subdivision algorithm, segmented display file, Display file compilation. Introduction to curve generation, Non parametric & parametric curves, Bezier curves, B-spline curves

UNIT-6 Visible Lines & Visible Surfaces (08)

Hidden surfaces: introduction, back-face removal algorithm: Painter‘s algorithm, Warnock algorithm, Z–buffer. Antialiasing and Antialiasing techniques, Half toning. Introduction to fractals, Fractal lines and surfaces.

Internal continuous assessment (ICA):

Student should perform 8 to 10 experiments based on OpenGL or any other freely available framework

1. Implementation of different graphics functions for object rendering with light and color modeling
2. Implementation of DDA line drawing algorithm.
3. Implementation of Bresenham‘s line drawing algorithm.
4. Implementation of Bresenham‘s Circle generation algorithm.
5. Implement polygon drawing and filling functions.
6. Implement 2D transformation.
7. Implementation of 3D transformation.
8. Implement Sutherland – Cohen line clipping algorithm.
9. Implementation of Warnock algorithm.
10. Implement a small animation package using Synfig or any other freely available framework.

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 publications.
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
Second Year B.Tech (Computer Science and Engineering) Semester-III
22CSU3CC5P : PYTHON PROGRAMMING

Teaching Scheme
Lectures: 2 Hours/week, 2 Credits
Practical: 2 Hours/week, 1 Credit

Examination Scheme
ICA : 25 Marks
ISE: 25 Marks
POE : 50 Marks

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

Pre-requisite:
Basic knowledge of any programming language including C, C++, Java.

COURSE OUTCOMES:
At the end of the course students will be able to

1. Understand and build basic programs using fundamental programming constructs like variables, conditional logic, looping and functions.
2. Understand and apply the collection types and string handling functions for solving real time problems.
3. Understand how object-oriented programming concepts work in Python.
4. Choose appropriate programming paradigms, interrupt and handle data using files to propose solution through reusable modules.
5. Propose possible error-handling constructs for unanticipated states/inputs.

SECTION-I

Unit 1: Introduction to Python (03)
Introduction to Python, python features and applications, Demo of Interactive and script mode, System Command Lines, Tokens in Python – Variables, Keywords, Comments, Literals, Data types, Indentation, Operators and its precedence, Expressions, Input and Print functions.

Unit 2: Control Structures (03)
Selective statements – if, if-else, nested if, if –elif ladder statements Iterative statements - while, for, Nested loops, else in loops, break, continue and pass statements.

Unit 3: Collections and String handling (06)
List: Create, Access, Slicing, Negative Indices, and List Methods, and comprehensions, range.
Tuples: Create Indexing and Slicing, Operations on Tuples.
Dictionary: Create, add, and replace values, operations on dictionaries.
Sets and frozen Sets: Create and operations on set
Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Negative indices, String functions. Regular expression: Matching
the patterns, Search and replace.

Unit 4: Functions in Python **(04)**

Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions
with arbitrary arguments, Recursion, Lambda functions, Generators, Higher Order Functions.

SECTION-II

Unit 5: Testing, Debugging **(03)**

Testing output, Unit tests in Python, Debugging programs, Measure execution time of small code snippets, Exception Handling-
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User-defined
Exceptions.

Unit 6: Object Oriented Programming in Python **(04)**

OOP Basics: Classes, Objects, Constructor & Self, Reference Variable, Abstraction & Encapsulation, Static variables & methods,
Aggregation, Inheritance.

Unit 7: Python Modules, Packages and File Handling **(05)**

Modules, Packages, Commonly used Python Modules: Math, Random, Time and Regular Expression.
File Handling-Files: Open, Read, Write, Append and Close. Tell and seek methods.

Unit 8: Multithreading **(02)**

Concurrent Execution: Thread-based parallelism, Process-based parallelism, Context Variables, Asynchronous I/O.

Internal Continuous Assessment (ICA) :

ICA shall include at least twelve of the following assignments. The assignment's objective should align with course's outcomes and focus on higher order bloom's cognitive levels.

Text Book:

1. Programming in Python 3, Mark Summerfield, Second Edition

Reference Books:

1. Python Cookbook, David Beazley and Brian K. Jones, Third Edition, Shroff Publishers & Distributors Pvt. Ltd., ISBN: 978-93-5110-140-6
2. Learning Python, Mark Lutz, 5th edition
3. Programming Python (English), Mark Lutz, 4th Edition
4. Testing Python, David Sale, Wiley India (P) Ltd., ISBN : 978-81-265-5277-1

E-resources:

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

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
Second Year B.Tech. (Computer Science & Engineering), Semester – III
22CEU3HU6T : UNIVERSAL HUMAN VALUES

Teaching Scheme
Lectures : 3 Lectures/week, 3 Credit

Examination Scheme
ESE : 60 Marks
ISE : 40 Marks

Course Outcomes:

Upon completion of this course, students will be able to

1. Appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2. Develop holistic perspective 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.
3. Appreciate the Universal Human Values and movement towards value-based living in a natural way.
4. Highlight ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education (7)

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**
7. at various levels.

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself! (7)

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 andenjoyer)
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*36

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship (8)

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):
6. Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals
7. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence (8)

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

Text Books :

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2. The teacher'smanual: 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*, CommonwealthPurblishers.
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, UniverseBooks.
6. SubhasPalekar, 2000, *How to practice Natural Farming,* Pracheen(Vaidik) KrishiTantraShodh,Amravati.
7. A Nagraj, 1998, *JeevanVidyaekParichay,* Divya Path Sansthan,Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond
9. A.N. Tripathy, 2003, Human Values, New Age InternationalPublishers.

Relevant websites, movies and documentaries

1. Value Education websites,http://uhv.ac.in,http://www.uptu.ac.in
2. Story of Stuff,http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics,USA
4. Charlie Chaplin, Modern Times, United Artists,USA
5. IIT Delhi, Modern Technology – the UntoldStory
6. Gandhi A., Right Here Right Now, CyclewalaProductions
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
Second Year B.Tech (Computer Science and Engineering), Semester-IV
22CSU4BS1T : APPLIED MATHEMATICS-II

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week,3 Credits	ESE–60 Marks
Tutorial–1 Hour/week,1 Credit	ISE – 40 Marks
	ICA- 25 Marks

Introduction:

This course introduces numerical methods (Unlike analytical methods) to solve algebraic and transcendental equations, simultaneous systems of linear equations and numerical integrations. 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. This course also introduces simplex method to solve LPP and assignment problems.

Course Prerequisite:

Student shall have knowledge of basic notions of classical set theory and probability theory. Student shall have to be familiar with some analytical method for solving equations, simultaneous equations & analytical methods to solve definite integrations.

Course Objectives:

1. To make students familiar with the uncertainty.
2. To give students comprehensive coverage of operations on fuzzy sets.
3. To make student use of numerical methods for the problems that cannot be solved analytically.
4. To enable students to solve Linear Programming Problems and Assignment Problems.

Course Outcomes:

1. Student can solve nonlinear algebraic and transcendental equations.
2. Student can solve simultaneous linear and nonlinear equations.
3. Students can apply numerical methods to evaluate definite integrals.
4. Student can apply knowledge of basics of fuzzy set theory to solve the problems.
5. Student can solve the fuzzy equations
6. Students can solve a particular kind of problems arises in day to day life using simplex method and Assignment Problems.

SECTION-I

Unit 1: Solution of algebraic and transcendental equation (07)

Basic properties of equations, False position method, Newton-Raphson method, Multiple roots, Newton's iterative formula for obtaining square root, system of non-linear equations by Newton Raphson method.

Unit 2: Solution of linear simultaneous equations **(07)**

Direct methods–Gauss Elimination method, Gauss Jordan methods, Method of factorization Iterative methods–Jacobi's method, Gauss-seidal method, power method to find eigen value and eigen vector.

Unit 3: Numerical Integration **(07)**

Integration using Newton's cote's formulae–Trapezoidal rule, simpson's $1/3^{rd}$ rule, Simpson's 3/8th rule, Weddel's rule, Romberg integrations, Double integrations.

SECTION-II

Unit 4:Classical (Crisp) sets of fuzzy sets: **(06)**

Crisp sets, Basic types of fuzzy sets, Basic concepts of fuzzy sets, fuzzy sets vs Crisp sets: Additional properties of $\alpha-$cuts, representation of fuzzy sets and extension principle of fuzzy sets.

Unit 5:Fuzzy arithmetic. **(08)**

Fuzzy number, arithmetic operations on intervals, arithmetic operations on fuzzy numbers, fuzzy equations, lattice of fuzzy numbers.

Unit 6:LPP and Assignment Problems **(07)**

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

Internal Continuous Assessment (ICA):

ICA shall consist of minimum six to eight assignments based on entire curriculum

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Text Books:

1. B.S. Grewal, Numerical methods, Khanna publication, New Delhi.
2. George J Klir and BoYuan, Fuzzy sets and Fuzzy logic– PHI India.
3. Fundamental of statistics, S.C.Gupta, Himalaya house publication.

Reference Books:

1. George J. Klir and Tina A. Folger, Fuzzysets, uncertainity and information, PHI India.
2. Robert J. Schiling, Sandra L Harris, Applied Numerical methods for Engineers.
3. M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical methods for scientific and engineering computations – New Age International ltd.
4. Pundir & Pundir, Fuzzysets and their applications – Pragati Publications.

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
Second Year B.Tech (Computer Science and Engineering) Semester-IV
22CSU4CC2T : THEORY OF COMPUTATION

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week,3 credits	ESE–60 Marks
Tutorial–1 Hour/week,1 credit	ISE –40 Marks
	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

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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 Outcome:

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.

SECTION-I

UNIT-1 Regular Expressions **(08)**

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

UNIT-2 Finite Automata **(08)**

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

UNIT-3 Kleen's Theorem **(08)**

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

UNIT- 4 Grammars & Languages **(08)**

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.

SECTION-II

UNIT– 5 Pushdown Automata **(07)**

Definition, deterministic PDA & types of acceptance, equivalence of CFGs & PDAs.

UNIT– 6 CFL's & Non CFL's **(06)**

Pumping Lemma & examples, inter section and complements.

UNIT– 7 Turing machines **(10)**

Models of computation, definition of TM as language Acceptors, Combining Turing machines, computing function with a TM

UNIT - 8 Variations in TM **(05)**

TMs with doubly infinite tapes, Multitape, Non-deterministic TM and universal TM.

Internal Continuous Assessment (ICA):

Students should solve assignments based on the topics below:

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 theorm
6. DFA minimization
7. Grammer, 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

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

22CSU4CC3T : MICROPROCESSORS and COMPUTER ARCHITECTURE

Teaching Scheme	**Examination Scheme**
Lectures:3 Hrs/week,3Credits	ESE:60 Marks
Practical:2 Hrs/week,1Credit	ISE:40 Marks
	ICA:25 Marks

Introduction:

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

Course Prerequisite: Knowledge of Digital Techniques.

Course Objectives:

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

Course Outcomes:

Students will be able to

1. 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.

SECTION-I

Unit 1: The Microprocessor and Its Architecture (7)

Internal Microprocessor Architecture-8086, Real Mode Memory Addressing, Addressing mode, Directives

Unit 2: Instructions (8)

Data Movement Instructions, Arithmetic and Logical Instructions, Program Control Instructions, Interrupt Instructions, Miscellaneous instructions.

Unit 3: Interrupts and DMA (7)

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

SECTION-II

Unit 4: Fundamentals of Computer Design **(7)**

Classes of computers, Defining Computer Architecture, Trends in Technology, Trends in Cost, Quantitative Principles of Computer Design

Unit 5: Memory Hierarchy Design **(8)**

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

Unit 6: Instruction Level Parallelism **(8)**

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
9. Design and simulate direct mapped cache for given parameter
10. Design a single instruction/more instruction CPU

Tools/Simulator:

MASM/TASM/V Lab Simulator/Any other tools or simulator
Vlab link-
http://vlabs.iitkgp.ernet.in/coa/#
https://cse11-iiith.vlabs.ac.in/List%20of%20experiments.html?domain=Computer%20Science

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Text Books:

1. The Intel Microprocessors: Architecture, Programming & Interfacing PHI- Barry B.Brey (Unit 1, 2, 3)
2. Computer Architecture, A Quantitative Approach, John L. Hennessey and David A. Patterson: 4th Edition, Elsevier (Unit 4, 5, 6)
3. AK Ray & K M Bhurchandi—Advanced Microprocessors and Peripherals

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Reference Books:

1. Liu & Gibson-MicrocomputerSystem8086 /8088‖PHI, 2nd Edition.
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
Second Year B.Tech (Computer Science and Engineering) Semester-IV
22CSU4CC4T : COMPUTER NETWORKS

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week,3 Credits	ESE–60 Marks
Practical–2 Hour/week,1 Credit	ISE–40 Marks
	ICA–25 Marks
	POE – 50 Marks

Introduction:

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

Course prerequisites:

This course requires prior knowledge of any basic programming language.

Course Objectives:

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

Course Outcomes:

Student will be able to

1. Understand the basic principles of Network reference models and functions.
2. Design a network with subnets using the different classless & classes of IP address.
3. Evaluate various networking protocols used in Internet
4. Select and use appropriate Application Layer Protocols for a given problem.

SECTION-I

Unit 1: Introduction to computer networks and Internet: **(05)**

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

Unit 2: Data Link Layer: **(10)**

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

Unit 3: Network Layer, Subnets: **(10)**

Introduction to IP Address, Classfull Addressing, Netmask, Subnet, CIDR, Subnetting Problems.
Routers, IPv4, IPv6: Functions of a Router: Forwarding and Routing, NAT,
Routing algorithms**:** Shortest path routing, Flow-based routing, Distance Vector Routing.

SECTION-II

Unit 4:Transport Layer: **(10)**

UDP: Introduction, User Datagram, UDP Services, UDP Applications.
TCP: TCP Services, TCP Features, Segment, A TCP Connection, Flow Control, Error Control, Congestion Control, TCP Timers.
SCTP: Introduction, SCTP Services, SCTP Features, Packet Format.
Socket Interface: Server, Client, Concurrency, Socket, Socket System Calls, Connectionless Iterative Server, Connection-oriented Concurrent Server.

Unit 5: Host Configuration and Remote Login. **(05)**

Dynamic Host Configuration Protocol(DHCP), Domain Name System(DNS); File Transfer Protocol(FTP), TELNET, SSH.

Unit 6: Application Layer: **(05)**

HTTP (Overview, Persistent and Non-Persistent, Message Format, Cookies, Caches), SMTP (Overview, Message Formats), IMAP, POP

Internal Continuous Assessment (ICA):

1. Installation of Wireshark Tool on windows.
2. Configuration of Network-Assigning IP Address, Subnet-Mask, Default Gateway, DNS Server Addresses & Testing Basic Connectivity.
3. Connectionless Iterative Server: Implementation of Client-Server Programs Using Iterative UDP Server.
4. Connection-oriented Concurrent Server: Implementation of Client-Server Programs Using Concurrent TCP Server.
5. Implementation of Domain Name Space (DNS) protocol
6. Implementation of Simple Network Chatting Application
7. Send an email using SMTP over the server at new.toad.com (an open SMTP server).
8. Implement a packet sniffer to capture packets of a specified link layer, network layer, transport layer, or application layer protocol.
9. Write a program to simulate either Go-Back-N or Selective Repeat protocols.
10. Implement a given subnet using ns3 simulator and demonstrate the flow of packets.
11. Design a given subnet using any simulator and demonstrate connectivity among all nodes as specified.
12. Critically analyze the WIT network design and suggest at least one improvement.
13. Course Mini project: Implement any one of these: a web server(HTTP Protocol) , email client (IMAP and POP procols) , a bittorrent client, DNS server and client (like nslookup) , etc, simulations of transport layer/network layer protocols; Adding features/bug fixes in apache2/nginx like projects

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Text Books:

1. J.F. Kurose and K. W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson, ISBN-13: 9780201976991
2. Behrouz A. Forouzan, Firouz Mosharraf, Computer Networks: A Top-Down Approach, Tata McGraw-Hill Education Pvt. Ltd, ISBN 10: 1259001563 / ISBN 13: 9781259001567

3. A S Tanenbaum, “Computer Networks”, Pearson Education, ISBN 9788177581652

Reference Books:

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

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
Second Year B.Tech. (Computer Science & Engineering) Semester – IV
22CSU4CC5P : Object Oriented Programming Using JAVA

Teaching Scheme	**Examination Scheme**
Lectures: 2 Hrs/Week, 2 Credits	ISE: 25 Marks
Practical: 2 Hrs/Week, 1 Credit	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 Objectives:

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

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Course Outcomes:

At the end of this 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. Test and debug a Java program for a given problem.

Unit 1 - Basics of Java and Strings in Java (04)

Basics: Java Runtime Environment (Oracle JDK, OpenJDK), Naming Conventions and Java profilers. Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input and Output, Data Types, Arrays, Type Casting.

Fundamentals: String Class and Methods, Immutability of Strings, StringBuffer Class and Methods, StringBuilder class and Methods.

Unit 2 - Classes, Objects and Methods (04)

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.

Unit 3 – Inheritance and Interfaces (05)

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 4- Exceptions and Error Handling (03)

Exceptions and Errors, Catching and Handling Exceptions, The try Block, The catch Blocks, The finally Block, Throwing Exceptions, Chained Exceptions, Custom Exceptions. JUnit Testing Framework.

Unit 5- I/O Programming (03)

Basic I/O: I/O Streams, Byte Streams, Character Streams, Buffered Streams, Scanning and Formatting, Data Streams, Object Streams , File I/O Classes: Reading, Writing, and Creating Files and Directories.

Unit 6 - Java Collections Framework and Package (05)

Introduction, The Arrays Class, Searching and sorting arrays of primitive data types, Sorting Arrays of Objects, The Comparable and Comparator Interfaces, Sorting using Comparable & Comparator, Collections: Lists, Sets, Maps, Trees, Iterator and Collections Class.
Package: Use of Package, CLASSPATH, Import statement, Static import, Access control

Unit 7 - Multithreading (03)

Creating Threads, Thread scheduling and priority, Thread interruptions and synchronization.

Unit 8 - GUI Programming using Swing (03)

Swing package, Layouts, Events, Listeners and Event handling, and Swing Components.

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

Internal Continuous Assessment (ICA):

- ICA shall consist of minimum 10 to 12 practical assignment problems.
- The assignments should test and develop student's practical proficiency and ability to use Java API Classes correctly for writing code for varied applications scenarios & use case requirements.
- Use of IDEs like BlueJ, Eclipse, Netbeans or any other FOSS alternative for Interactive development and debugging of Java applications is highly recommend to enhance hands-on skills in Java Programming of Students.

Text Books:

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

4. Programming with Java, Balaguruswamy, TMH
5. Internet and Java Programming, Tanweer Alam, Khanna Publishing House

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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 Java™ Tutorials. Oracle Inc.

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e-resources:

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

Walchand Institute of Technology, Solapur
S.Y.B.Tech. (Computer Science and Engineering), Semester-IV
22GEU4MC2T : ENVIRONMENTAL STUDIES

Teaching Scheme:
Lecture: 1 hr./week, 1 Credit

Examination scheme:
ESE:50 Marks

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:
At the end of course student is 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, economical and legal policies involved in the resolution of environmental problems.

Unit 1: Nature of Environmental studies (02)
Definition, scope and importance. Multidisciplinary nature of environmental studies, Need for public awareness.

Unit 2:Natural resources and associated problems. (08)

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 3: Ecosystems (08)

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 4: Biodiversity and its conservations (08)

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 5: Environmental Pollutions (08)

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

6. Social issues and the Environment (08)

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

7. Environmental Protection (08)

Environment Protection act

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

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, New Delhi.
3. https://www.google.co.in/images
4. https://envfor.nic.in/legis/legis.html
5. Dr Prakash Sawant(2009) “Environment studies” Fadake PublisherKolhapur
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.