Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2022
'B^{++}' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

(As per New Education Policy 2020)

Subject:- Computer Science & Engineering

Name of the Course: S. Y. B. Tech. (Sem.– III & IV)

(Syllabus to be implemented from-2024-25)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

NEP 2020 Compliant Curriculum

With effect from 2023-2024

Semester I (Common for All Engineering Branches)

Course Type	*Course Code*	*Name of the Course*	*Engagement Hours*		*Credits*	*FA*	*SA*		*Total*
			L	*P*		*ESE*	*ISE*	*ICA*	
BSC	BS-01/ BS-02	Engineering Physics / Engineering Chemistry $	3	2	4	70	30	25	125
	BS-03	Engineering Mathematics-I	3	2	4	70	30	25	125
ESC	ES-01/ ES-02	Basics of Civil and Mechanical Engineering / Basic Electrical & Electronics Engineering $	3	2	4	70	30	25	125
	ES-03	Engineering Mechanics	3	2	4	70	30	25	125
AEC	AE-01	Communication Skills	1	2	2		25	25	50
CC	CC-01	Sports and Yoga or NSS/NCC/UBA (Liberal Learning Course-I)	1	2	2			25	25
SEC	SE-01	Workshop Practices		2	1			25	25
		Total	**14**	**14**	**21**	**280**	**145**	**175**	**600**
		Student Induction Program**							

Semester II (Common for All Engineering Branches)

Course Type	*Course Code*	*Name of the Course*	*Engagement Hours*		*Credits*	*FA*	*SA*		*Total*
			L	*P*		*ESE*	*ISE*	*ICA*	
BSC	BS-01/ BS-02	Engineering Physics / Engineering Chemistry $	3	2	4	70	30	25	125
	BS-04	Engineering Mathematics - II	3	2	4	70	30	25	125
ESC	ES-01/ ES-02	Basics of Civil and Mechanical Engineering / Basic Electrical & Electronics Engineering $	3	2	4	70	30	25	125
		Engineering Graphics and CAD		4	2		25	50	75
SEC	SE-02	Data Analysis and Programming Skills	1	2	2		25	25	50
CC	CC-02	Professional Personality Development (Liberal Learning Course-II)	1	2	2		25	25	50
IKS	IKS-01	Introduction to Indian Knowledge System	2		2		25	25*	50
		Total	**13**	**14**	**20**	**210**	**190**	**200**	**600**
		Democracy, Elections and Good Governance *	**1**			**50**			

***For IKS activity report should be submitted**

BSC- Basic Science Course ESC- Engineering Science Course, PCC- Programme Core Course, AEC- Ability Enhancement Course, IKS- Indian Knowledge System, CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Course

- Legends used–

L	Lecture	FA	Formative Assessment
T	Tutorial	SA	Summative Assessment
P	Lab Session	ESE	End Semester Examination
		ISE	In Semester Evaluation
		ICA	Internal Continuous Assessment

Notes-

1. $ - Indicates approximately half of the total students at F. Y. will enroll under Group A and remaining will enroll under Group B.

   Group A will take up course of Engineering Physics (theory & laboratory) in Semester I and will take up course of Engineering Chemistry (theory & laboratory) in semester II.

   Group B will take up course of Engineering Chemistry (theory & laboratory) in Semester I and will take up course of Engineering Physics (theory & laboratory) in semester II.

2. # - For the Course (C113) Basic Electrical & Electronics Engineering, Practicals of Basic Electrical Engineering and Basic Electronics Engineering will be conducted in alternate weeks.

3. @ - For the Course (C113) Basics of Civil and Mechanical Engineering, Practicals of Basics of Civil Engineering and Basics of Mechanical Engineering will be conducted in alternate weeks.

4. In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level.
   Internal Continuous Assessment Marks (ICA) is calculated based upon student's performance during laboratory sessions / tutorial sessions.

5. *- Democracy, Elections & Good Governance is mandatory course. The marks earned by student with this course shall not be considered for calculation of SGPA/CGPA. However, student must complete End Semester Examination (ESE) of 50 marks (as prescribed by university) for fulfilment of this course. This course is not considered as a passing head for counting passing heads for ATKT. However, student must pass this subject for award of the degree.

6. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

**** GUIDELINES FOR INDUCTION PROGRAM (C119)**

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economic, regional and cultural backgrounds. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose.
An induction program for the new UG entrant students is proposed at the commencement of the first semester. It is expected to complete this induction program before commencement of the regular academic schedule.
Its purpose is to make new entrants comfortable in their new environment, open them up, set a healthy daily routine for them, create bonding amongst the peers as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.
The Induction Program shall encompass (but not limited to) below activity –

1. Physical Activities
2. Creative Arts
3. Exposure to Universal Human Values
4. Literary Activities
5. Proficiency Modules
6. Lectures by Experts / Eminent Persons
7. Visit to Local Establishments like Hospital /Orphanage
8. Familiarization to Department

Induction Program Course do not have any marks or credits however performance of students for Induction Program is assessed at institute level using below mandatory criteria –

1. Attendance and active participation
2. Report writing

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Semester -III

Distribution	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*			*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	*OE/ POE*	
PCC	CSEPCC-01	Discrete Mathematical Structure	3			03	70	30			100
PCC	CSEPCC-02	Computer Graphics	3			03	70	30			100
PCC	CSEPCC-03	Data Structure	3		2	04	70	30	25	25	150
CEP/FP	CSEFP-01	Computer Graphics Lab			2	01			25	25	50
CEP/FP	CSEFP-02	Python Programming			2	01			25	25	50
Entrepreneurship	EM-01	Product Development and Entrepreneurship	1	1		02		50	25		75
OE	OE-01	Open Elective-I	2		2	03	70	30	25		125
MDM	MDM-01	MD Minor-I	2		2	03	70	30	25		125
VEC	VEC-01	Universal Human Values	1		2	02	50*		25		75
		Total	**15**	**1**	**12**	**22**	**400**	**200**	**175**	**75**	**850**
		Environmental Science	1								

***For VEC-based examination to be conducted.**

PCC- Programme Core Course, PEC-Programme Elective Course
AEC- Ability Enhancement Course, IKS- Indian Knowledge System, CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Course
MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme

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Semester -IV

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CSEPCC-04	Computer Organization and Architecture	3			03	70	30			100
PCC	CSEPCC-05	Theory of Computation	2	1		03	70	30	25		125
PCC	CSEPCC-06	Computer Network	3		2	04	70	30	25	25	150
SEC	CSESEC-01	Object Oriented Programming using Java	1		2	02			25	25	50
Economic/ Management	EM-02	Project Management and Economics	2		0	02		25	25		50
OE	OE-02	Open Elective-II	2		2	03	70	30	25		125
MDM	MDM-02	MD Minor-II	2		2	03	70	30	25		125
VEC	VEC-02	Professional Ethics	1		2	02	50*		25		75
		Total	**16**	**1**	**10**	**22**	**400**	**175**	**175**	**50**	**800**
		Environmental Science	1				40	10			50

***For VEC-02 : MCQ based examination to be conducted.**

PCC- Programme Core Course, PEC-Programme Elective Course
AEC- Ability Enhancement Course, IKS- Indian Knowledge System, CC- Co-curricular Courses,
VSEC-Vocational and Skill Enhancement Course
MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme

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Semester -V

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CSEPCC-07	Design And Analysis Of Algorithms	3			03	70	30			100
PCC	CSEPCC-08	Operating System	3		2	04	70	30	25		125
PCC	CSEPCC-09	Database Engineering	3		2	04	70	30	25	25	150
PEC	CSEPEC-01	Programme Elective Course-I	3		2	04	70	30	25		125
AEC	AEC-02	Creativity and Design Thinking	1		2	02	50*		25		75
OE	OE-03	Interdisciplinary Mini Project	1		2	02			25	25	50
MDM	MDM-03	MD Minor-III	2		2	03	70	30	25		125
		Total	**16**		**12**	**22**	**400**	**150**	**150**	**50**	**750**

*** For AEC-02: MCQ- based examination to be conducted.**

PCC- Programme Core Course, PEC-Programme Elective Course
AEC- Ability Enhancement Course, IKS- Indian Knowledge System, CC- Co-curricular Courses , VSEC-Vocational and Skill Enhancement Course
MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme

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Semester -VI

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CSEPCC-10	Software Engineering	2			03	70	30			100
PCC	CSEPCC-11	Cloud Computing	2		2	03	70	30	25	25	150
PCC	CSEPCC-12	System software	3		2	04	70	30	25		125
PEC	CSEPEC-02	Programme Elective Course-II	3		2	04	70	30	25	25	150
PEC	CSEPEC-03	Programme Elective Course-III	3	1		04	70	30	25		125
SEC	CSESEC-02	Projects on Industrial Application			4	02			25	50	75
MDM	MDM-04	MD Minor-IV	2		2	03	70	30	25		125
		Total	**15**	**1**	**12**	**22**	**420**	**180**	**150**	**100**	**850**

PCC- Programme Core Course, PEC-Programme Elective Course
AEC- Ability Enhancement Course, IKS- Indian Knowledge System, CC- Co-curricular Courses , VSEC-Vocational and Skill Enhancement Course
MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme

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Semester -VII

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CSEPCC-13	Artificial Intelligence and Machine Learning	3			03	70	30			100
PCC	CSEPCC-14	Information And Cyber Security	2		2	03	70	30	25		125
PEC	CSEPEC-04	Project Elective Course-IV or MOOCS##	4			04	100				100
Project	CSEProject	Capstone Project			8*	04			100	100	200
RM	RM	Research Methodology and IPR	3		2	04	70	30	25		125
MDM	MDM-05	MD Minor-V	2			02	70	30			100
		Total	**14**		**12**	**20**	**380**	**120**	**150**	**100**	**750**

Students should attend MOOCS in that 4hrs, if MOOCS is chosen, Mini Project/ Assignment related to MOOCS and ICA marks to be given based on that.

PCC- Programme Core Course, PEC-Programme Elective Course
AEC- Ability Enhancement Course, IKS- Indian Knowledge System, CC- Co-curricular Courses,
VSEC-Vocational and Skill Enhancement Course
MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme

*Load based on the project groups

List of MOOCS courses related to CSEPEC-04 will be provided by BOS time to time.

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Semester -VIII

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CSEPCC-10	Data Science	4#			04	100				100
PEC	CSEPEC-05	Self learning offered by Institute / MOOC Courses	4#			04	100				100
OJT	CSEOJT	On-Job Training			24	12			200	100	300
		Total	**8**		**24**	**20**	**200**		**200**	**100**	500

Students will practice or attend in Self-Learning mode.
PCC- Programme Core Course, PEC-Programme Elective Course
AEC- Ability Enhancement Course, IKS- Indian Knowledge System, CC- Co-curricular Courses,
VSEC-Vocational and Skill Enhancement Course

List of MOOCS courses related to CSEPEC-05 will be provided by BOS time to time.

Basket of Programme Elective Course (PEC)

PEC/Sem	Course code and name
CSEPEC - 01/ V	CSEPEC–01A:SoftwareTestingAndQualityAssurance CSEPEC– 01B: Human Computer Interface CSEPEC – 01C: Mobile Computing CSEPEC–01D:ObjectOriented Modeling and Design
CSEPEC - 02/ VI	CSEPEC – 02A: Data Mining CSEPEC– 02B: Network Security CSEPEC–02C: Advanced Operating System CSEPEC – 02D: Management Information System
CSEPEC - 03/ VI	CSEPEC – 03A: Internet of Things CSEPEC – 03B: Big Data Analytics CSEPEC–03C:ArtificialNeuralNetwork
CSEPEC - 04/ VII OR	CSEPEC–04A:DevOps CSEPEC – 04B:Business Intelligence CSEPEC–04C:Distributed Systems
CSEPEC - 04/ VII	MOOC Courses offered by NPTEL/SWAYAM CSEPEC – 04D : <As per the list provided by BoS> CSEPEC – 04E : <As per the list provided by BoS>
CSEPEC - 05/ VIII	MOOC Courses offered by NPTEL/SWAYAM CSEPEC – 05E: <As per the list provided by BoS> CSEPEC – 05F: <As per the list provided by BoS>

A. Multidisciplinary Minor in "Artificial Intelligence & Data Science"

Semester	Course Code	Course Title
III	CSEMDM-01A	Programming basics using Python
IV	CSEMDM-02A	Data Pre-processing& Visualization
V	CSEMDM-03A	Machine Learning
VI	CSEMDM-04A	Predictive Analytics
VII	CSEMDM-05A	Artificial Intelligence

B. Multidisciplinary Minor in "Software Engineering"

Semester	Course Code	Course Title
III	CSEMDM-01B	Software Engineering
IV	CSEMDM-02B	Software Testing and Quality Assurance
V	CSEMDM-03B	Object Oriented Modelling and Design
VI	CSEMDM-04B	Management Information System
VII	CSEMDM-05B	Information Retrieval

A. Honors in Artificial Intelligence and Machine Learning

Semester	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***		***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	
III	CSEHON-01A	Machine Learning	3	1		4	70	30	25	125
IV	CSEHON-02A	Reinforcement Learning	3		2	4	70	30	25	125
V	CSEHON-03A	Natural Language Processing	3		2	4	70	30	25	125
VI	CSEHON-04A	Deep Learning	3		2	4	70	30	25	125
VII	CSEHON-05A	Mini Project			4*	2			50	50
		Total	12	1	10	18	280	120	150	550

*indicates contact hours

FA Formative Assessment

SA Summative Assessment

B. Honors in Cyber Security

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	
III	CSEHON-01B	Cryptography	3	1		4	70	30	25	125
IV	CSEHON-02B	Network Security and Secure Coding	3		2	4	70	30	25	125
V	CSEHON-03B	Cyber forensic	3		2	4	70	30	25	125
VI	CSEHON-04B	Information Auditing and Monitoring	3		2	4	70	30	25	125
VII	CSEHON-05B	Mini Project			4*	2			50	50
		Total	**12**	**1**	**10**	**18**	**280**	**120**	**150**	**550**

*indicates contact hours

C. Honors in Data Science

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	
III	CSEHON-01C	Mathematics for Data Science	3	1		4	70	30	25	125
IV	CSEHON-02C	Data Pre-processing& Visualization	3		2	4	70	30	25	125
V	CSEHON-03C	Machine Learning	3		2	4	70	30	25	125
VI	CSEHON-04C	Predictive Analytics	3		2	4	70	30	25	125
VII	CSEHON-05C	Mini Project			4*	2			50	50
		Total	**12**	**1**	**10**	**18**	**280**	**120**	**150**	**550**

*indicates contact hours

Honors with Research*

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*	*Credits*	*SA*		*Total*
			P		*ICA*	*OE*	
VII	CSERES-01	Research Project Phase-01	9 #	9	100	100	200
VIII	CSERES-01	Research Project during OJT	9 ##	9	100	100	200
		Total	18	18	200	200	400

#Along with 9 hours of engagement hours, 4.5 Hrs. activities for preparation for community engagement and service, preparation of reports, etc.

Along with 9 hours of engagement hours 4.5 Hrs. activities for preparation for community engagement and service, preparation of reports, etc. and independent reading during On Job Training and preferably related to On Job Training activities.

These Courses are open for students of all the UG Engineering Program.

Semester: III List of open elective - I

Sr. No.	List of Open Electives
1.	OE-01A: Advanced Mathematics and Statistics
2.	OE-01B Digital Marketing and E- Commerce
3.	OE-01C Humanities and Social Sciences
4.	OE-01D Industrial and Quality Management
5.	OE-01E Mathematics for Software and Hardware
6.	OE-01F Soft Skills and Personality Development

Semester: IV List of open elective – II

Sr. No.	List of Open Electives
1.	OE-02A Entrepreneurship and Innovation
2.	OE-02B Environmental Sustainability
3.	OE-02C Renewable Energy
4.	OE-02 D Measurement, Instrumentation and Sensors
5.	OE-02E Operation Research
6..	OE-02F Computational Mathematics
7.	OE-02 G Professional Business Communication

Semester III

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Second Year B.Tech (Computer Science & Engineering)

Semester-III

CSEPCC01 -DISCRETE MATHEMATICAL STRUCTURES

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week, 3 Credits	ESE –70 Marks
	ISE – 30 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 systems& Boolean algebra.

Course Prerequisite: Students shall have knowledge of basic mathematics.

Course Objectives:

1. To get acquainted with 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.

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.

Text books:

1. Discrete mathematical structures with applications to computer science -- J. P. Tremblay & R. Manohar (MGH International)

Reference Books:

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

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Semester-III
CSEPCC-02 COMPUTER GRAPHICS

Teaching Scheme
Lectures:3Hrs/week,3 credits

Examination Scheme
ESE:70 Marks
ISE: 30 Marks

Introduction:
This course introduces the basics of computer graphics and different basic graphics functions. It also develops the ability for implementation of different algorithms. With this course students can acquire computer graphics techniques, its uses and implementation details.

Course Prerequisite: Knowledge of C Programming & Mathematics.

Course Objectives:
1. To introduce basics elements of computer graphics and graphic devices.
2. To demonstrate the line, circle and polygon filling algorithms.
3. To demonstrate 2D and 3D transformations.
4. To use clipping algorithms.
5. To introduce hidden and visible surfaces, different types of curves.

Course Outcome:
Student will able to
1. Draw graphical elements using built-in graphic functions in ‘C’.
2. Differentiate different graphical devices.
3. Draw lines, Circles and fill polygons.
4. Apply simple 2D and 3D transformations to given object and create simple 2D animations
5. Demonstrate different clipping algorithms, surfaces and different types of curves.

SECTION I

UNIT-1 Basic Concepts & Devices (07)
Introduction to Computer Graphics, Basic terms: pixel, frame buffer, resolution, aspect ratio, Video display devices: Refresh CRT, Raster scan display, Random scan display, color CRT monitors, Interactive Devices:joysticks, touchpanels, lightpens, Application of Computer Graphics,.

UNIT-2 Raster Scan Graphics (08)
Line drawing algorithms: DDA, Bresenham’s algorithm, Bresenham's Circle generation algorithm, Run Length Encoding, Polygon filling: Scan converting polygon, Edge fill, Edge flag, Seed fill.

UNIT-3 Geometric Transformations (09)
2DTransformation: Translation, Rotation,Scaling, Reflection, Shearing, Combined transformation, Rotation about an arbitrary point, Reflection through an arbitrary line.

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

SECTION II

UNIT-4 Clipping & Display File Compilation (08)
Sutherland-Cohen Line clipping algorithm, Midpoint subdivision algorithm, Viewing transformation, Window transformation, segmented display file, Display file compilation.

UNIT-5 Visible Lines & Visible Surfaces **(08)**

Hidden surfaces: introduction, back-face removal algorithm: Painter‘s algorithm, Warnock algorithm, Z–buffer. Antialiasing and antialiasing techniques, Halftoning.

UNIT-6 Plane curves & Space curves **(08)**

Introduction to curve generation, Curverepresentation, interpolation, Nonparametric & parametric curves, Bezier Curves, B-spline curves, Introduction to fractals, Fractal lines and surfaces.

Text Books:

1. Computer Graphics**(Chapter 1)**-Donald Hearn, Baker (second edition)PHI publications.
2. Procedural elements for Computer Graphics **(Chapter 2,4,5)** - David F. Rogers (second edition) Tata McGraw Hill publications.
3. Mathematical elements for Computer Graphics **(Chapter 3,6)** - Rogers, Adams (second edition)McGraw Hill Publishing Company.

Reference Books:

1. Computer Graphics with virtual reality systems -Rajesh K. Maurya.
2. Principles of Interactive Computer Graphics - William Newman, Sproull (second edition) McGraw-Hill Publication.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Second Year B.Tech (Computer Science & Engineering)
Semester-III

CSEPCC-03 DATA STRUCTURE

Teaching Scheme
Lectures: 3Hrs/Week, 3 Credits
Practical: 2Hrs/Week, 1Credit

Examination Scheme
ESE:70 Marks
ISE:30 Marks
ICA:25 Marks
POE:25Marks

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

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SECTION –I

UNIT 1 : Introduction to Data Structures & Searching-Sorting (06)
What is Data Structure, types of data structures – static, dynamic, primitive, non-primitive, linear, non-linear,Time Complexity, Space Complexity. **Study and Implementation of Searching Algorithms-** Linear search and Binary search. **Study and Implementation of Sorting Algorithms-** Bubble sort, Insertion sort, Merge sort, Quick sort, Selection sort, Shell sort and Radix sort, Heap sort.

UNIT 2 : Hashing (05)
Different Hash Functions, choosing a hash function Collision Resolution by Open Addressing: Linear probing, quadratic probing, double hashing, Collision Resolution by Chaining

UNIT 3 : Stack and Queue (06)
Stack: Definition, representation, Operations, Implementation and applications like conversion of polish notations, evaluation of postfix expressions.
Queue: Definition, representation, Operations, Implementation of Linear Queue, Circular Queue, Priority Queue.

UNIT 4 : Lists (06)
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 5 : Trees **(06)**

Definition, Traversal, Linked implementation, Operations on: Binary trees and Binary Search Trees, Introduction to Threaded Binary trees

UNIT 6 :Multiway Trees **(06)**

Multiway search Trees, Balanced Multiway Trees, Traversing a Multiway Tree, Insertion in Multiway Tree: BTrees, B+ Trees

UNIT 7 : Height Balance Trees **(06)**

AVL Trees: Definition, Height of an AVL Tree, Insertion, Deletion of node in AVL Trees, Single and Double rotation of AVL Trees.

UNIT 8 : Graphs **(07)**

Definition, Undirected and Directed Graphs, Graph Terminologies, Computer Representation of Graphs, Graph Traversal methods: Depth First and Breadth First Search, Application : Shortest Path using Dijkstra's algorithm.

Internal Continuous Assessment(ICA):

ICA shall consist of minimum 15 practical assignment problems based on all above topics in line with course outcome. Practical problem statements should cover all topics mentioned in the 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 YedidyahLangram, 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, DepaliShrivastava, BPB Publications
4. Fundamentals of Data Structures, SartajSahni, University Press
5. Data Structures, R S Salaria, Khanna Publishing House
6. Data Structures through C,YashwantKanetkar, BPB Publications
7. Expert Data Structures with C++, R B Patel, Khanna Publication

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Second Year B.Tech (Computer Science & Engineering)

Semester-III

CSEFP-01:Computer Graphics Lab

Teaching Scheme
Practical: 2 Hour/week, 1 Credit

Examination Scheme
ICA - 25 Marks
POE - 25 Marks

Course Outcome:

Student will able to

1. Draw graphical elements using built-in graphic functions in ‘C’.
2. Differentiate different graphical devices.
3. Draw lines, Circles and fill polygons.
4. Apply simple 2D and 3D transformations to given object and create simple 2D animations
5. Demonstrate different clipping algorithms, surfaces and different types of curves

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Internal continuous assessment(ICA):

Students should perform 8 to10 experiments based on following guidelines.

1. To Study Basic graphics functions.
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 filling algorithms.
6. Implement 2D transformation.
7. Implementation of 3D transformation.
8. Implement Sutherland–Cohen line clipping algorithm.
9. Implementation of Warnock algorithm.
10. Case study of OpenGL
11. Implement a small animation package.

POE

Practical – Oral Examination shall be based on the knowledge of students in the curriculum and performance in above listed ICA.

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Second Year B.Tech (Computer Science & Engineering)

Semester-III

CSEFP-02: PYTHON PROGRAMMING

Teaching Scheme	**Examination Scheme**
Practical: 2 Hour/week, 1 Credit	ICA - 25 Marks
	POE - 25 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 :

Students should have knowledge of basic programming.

Course Objectives:

1. To introduce the core components of the Python programming language.
2. To study library packages to write applications using python
3. To study GUI, exception handling and debugging python programs.

Course Outcomes :

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

1. Write Python scripts using procedure oriented approach of writing a computer program.
2. Write Python scripts using Object oriented approach of writing a computer program
3. Exhibit ability to use Python's standard library packages to provide solutions to a given problem.

SECTION-I

Unit 1 - Introduction to Python (02)

Introducing the Python Interpreter, Program Execution, Execution Model Variations, The Interactive Prompt.

Unit 2 - Introduction to Python Programming Constructs (08)

Data types and variables, Control structures, loops and functions, Lambdas, Generators, Exception Handling, String handling, Scope of variables, Modules, Packages.

Unit 3 - Introduction to Object Oriented Programming in Python (05)

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

SECTION - II

Unit 4 - Python Standard Library Modules and Packages (08)

Regular expression operations, Basic date and time types, General calendar-related functions, NumPy, Shallow and deep copy operations, Mathematical functions, Generate pseudo-random numbers.

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

Unit 5 – Multithreading and Introduction to GUI programming **(04)** Concurrent Execution: Thread-based parallelism, Process-based parallelism, Context Variables, Asynchronous I/O. Introduction to GUI programming in python.

Unit 6 – Testing and Debugging **(03)**
Testing output, Unit tests in Python, Debugging programs, Measure execution time of small code snippets.

Internal Continuous Assessment (ICA):
Minimum 12 assignments based on above topics.

- The assignments should test and develop student's practical proficiency and ability to use Python standard library modules and packages efficiently in writing effective code for varied applications scenarios & requirements, use cases.
- Use of IDEs like PyCharm, Eclipse with PyDev, Jupyter Notebook for Interactive development and debugging of Python applications is highly recommended to enhance hands on skills in Python Programming of Students.
- Every assignment shall be performed under Python 2.x or 3.x runtime environment configured using any of the following tools 1) pyenv 2) virtualenv3)Anaconda

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Text Book:
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

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e-resources:

1. Python 2.7.16 documentation - https://docs.python.org/2/
2. Python 3.7.3 documentation - https://docs.python.org/3/

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Second Year B.Tech (Computer Science & Engineering)

Semester-III

EM-01Product Development and Entrepreneurship

Teaching Scheme
Theory: 1 Hour/Week, 1 Credit
Tutorial: 1 Hour/week, 1 Credit

Examination Scheme
ISE-50Marks
ICA - 25 Marks

Course Outcomes :

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

EM- 01.01 Understand the process of designing and developing a product.
EM- 01.02 Understand customer specifications and configuring the product's functionality.
EM- 01.03 Select architecture of product and virtual prototyping.
EM- 01.04 Understand entrepreneurship for starting venture.
EM- 01.05 Determine different types of functional plans and feasibility study.
EM- 01.06 Explain various types of IPR and its need.

SECTION – I

UnitNo.1:ProductDevelopmentFundamentals Hours: 03				
Sr.No.	Subunit	Hours	Assessment	Bloom'sLevel
1.1	Features of Successful Product development, Generaldevelopment process, Concept development: Idea generationprocess,Conceptselection, ConceptEmbodiment,Processflows.	01	Explanation, Definition, Classification	Remembering, Understanding
1.2	Productlifecycles,Thechallengesof Product development	01	Explanation	Remembering, Understanding
1.3	Reverse Engineering and Redesign processes for product design, Differences between Reverse Engineering and Redesign processes	01	Explanation, Definition, Classification	Remembering, Understanding
UnitNo.2:ProductPlanning,CustomerNeed,productconfigurationanddesign Hours: 03				
Sr.No.	*Subunit*	*Hours*	*Assessment*	*Bloom'sLevel*
2.1	Searching Opportunities, Evaluate and Prioritize, Identifying need of the customers:Typesofcustomerneeds, Customerneedmodels,Methods	01	Explanation, Definition,	Remembering, Understanding
2.2	OrganizingandPrioritizingcustomer needs:	01	Explanation	Remembering, Understanding
2.3	IntroductiontoDesigntech for function niques, Function analysis, Introduction to design and product evaluation	01	Explanation, Definition, Evaluation	Remembering, Understanding
Unit No. 3:Introduction to product architecture and prototyping Hours: 03				
3.1	Product Architectures type, Product Modularity and types, Modular design andmethods.Advancefunctional methods	01	Explanation, Definition,	Remembering, Understanding

3.2	Introduction to virtual reality, Design using virtual prototyping, Applicationofdigitaltools,Introductionto Additive manufacturing.	02	Explanation	Remembering, Understanding

SECTION – II

UnitNo.4:IntroductiontoEntrepreneurship Hours: 03				
Sr.No.	*Subunit*	*Hours*	*Assessment*	*Bloom'sLevel*
4.1	Entrepreneurship Introduction, Definition,Skillsandabilitiesrequiredforsuccessfulentrepreneurs;roleofentrepreneurshipindevelopment of economy	01	Explanation, Definition,	Remembering,Understanding
4.2	ProcessofEntrepreneurship	01	Explanation	Remembering,Understanding
4.3	Differences between managerial vs. entrepreneurial approach	01	Explanation, Definition, Classification	Remembering,Understanding
UnitNo.5:InitiatingtheEntrepreneurship Hours: 03				
Sr.No.	*Subunit*	*Hours*	*Assessment*	*Bloom'sLevel*
5.1	Competitor and industryanalysis; feasibilitystudy:Analyzingdifferentfeasibilities	01	Explanation,	Remembering,Understanding
5.2	Introduction to different functional plans like marketing plan, organizational plan, :manpower planning;Financialplan,financialAssistancefromdifferentsources	02	Explanation	Remembering,Understanding
UnitNo.6:IntroductiontoIPRforEntrepreneurship Hours:03				
6.1	Intellectualpropertyrights:concept, need;	01	Explanation, Definition,	Remembering,Understanding
6.2	DifferenttypesofIPRlikepatents, trademarks,copyrights,licensing; franchising	02	Explanation	Remembering,Understanding

Reference Books:

1. Product Design for Engineers, By DevdasShetty, Cengage Learning
2. Product Design, by Kevin Otto, Kristin wood, Pearson Education Inc.
3. Product design and development, by K.T. Ulrich and S.D. Eppinger, Tata McGraw Hill
4. Product Development, by Chitale& Gupta, Tata McGraw Hill
5. Product design & process Engineering by Niebel& deeper, McGraw hill
6. Entrepreneurship, Hisrich, Robert D., Michael Peters and Dean Shepherded, Tata McGraw Hill, ND
7. Entrepreneurship, Brace R., and R., Duane Ireland, , Pearson Prentice Hall, New Jersy (USA).
8. Entrepreneurship Development and Small Business Enterprises, Charantimath, Poornima, Pearson Education, New Delhi.

TermWork:

Termworkshouldbebasedonassignments(Case studies) basedonabovetopics.

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Second Year B.Tech (Computer Science & Engineering)
Semester-III
VEC-01: Universal Human Values

Teaching Scheme
Theory: 1 Hour/Week, 1 Credit
Practical: 2 Hour/week, 1 Credit

Examination Scheme
ESE-50Marks
ICA - 25 Marks

Course Outcomes:

Upon completion of this course, students will be able to,

- VEC01.1 AppreciatetheessentialcomplementarilybetweenVALUESandSKILLStoensureSustainedhappinessandprosperity,whicharethecoreaspirationsofallhumanbeings.
- VEC01.2 Develop holistic perspective towards life and profession as well as towards happiness and prosperitybased on a correct understandingof the Human realityand the rest of Existence.
- VEC01.3 AppreciatetheUniversalHumanValuesandmovementtowardsvalue-basedlivingina natural way.
- VEC01.4 Highlightethicalhumanconduct,trustfulandmutuallyfulfillinghumanbehaviorand 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 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 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 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): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- 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 andself-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, Excelbooks, New Delhi, 2010, ISBN 978-8-174-46781-2
2. The teacher‟smanual: R.R Gaur, R Sangal, G P Bagaria, A foundation course inHuman Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010 Briggs,Britain.

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. 3Sussan 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 toGrowth, 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 &Briggs,Britain.
9. A.N. Tripathy, 2003, Human Values, New Age InternationalPublishers.

Relevant websites, movies and documentaries

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

Semester-IV

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Second Year B.Tech (Computer Science and Engineering)

Semester-IV

CSEPCC-04: Computer Organization and Architecture

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week, 3 credits	ESE–70 Marks
	ISE – 30 Marks

Introduction: Computer Organization and Architecture (COA) course provide students with an understanding of the design of fundamental blocks used for building a computer system and interfacing techniques of these blocks to achieve different configurations of an "entire computer system". It introduces detailed understanding of various processor micro architectural designs, which include pipeline design, and multi-core processor design.

Course Prerequisite: Student shall have undergone a course on Digital Logic Design and Operating system.

Course Objectives:

1. To impart basic concept of computer organization and architecture.
2. To help student to understand various memory module.
3. To facilitate student in understanding in learning IO communication.
4. To develop deeper understanding of instruction and multiprocessor level parallelism.

Course Outcomes:

At the end of the course students will be able to

1. Describe the functional architecture of computing systems.
2. Analyse various parallel programming model.
3. Use ARC Processor based instructions to write assembly language program.
4. Demonstrate the design aspects of memory, instruction level parallelism and multiprocessors.

SECTION-I

Unit 1 - Introduction (05)

A Brief History of Computing, The Von Neumann Model, Generations of Computers, The System Bus Model, Levels of Machines: Upward Compatibility, The Levels of computer, A Typical Computer System.

Unit 2 - The Instruction Set Architecture and Memory (06)

Hardware Components of the Instruction Set Architecture, ARC - A RISC Computer , Pseudo Operations, Synthetic Instructions, Examples of Assembly Language Programs, Accessing Data in Memory-Addressing Modes, The Memory Hierarchy, Cache Memory

Unit 3: Parallel Models, Languages and Compilers (07)

Parallel Programming Models: Shared variable model, Message passing model, Data Parallel Model, Object Oriented Model, Functional and Logic Models. Parallel Languages and Compilers: Language Features for parallelism, Parallel Language Constructs, Optimizing Compilers for Parallelism

SECTION-II

Unit 4 - Input/ Output Organization (05)

External devices, I/O module, Programmed I/O, Interrupt driven I/ O, Direct memory access, I/O channels and processors, External interface.

Unit 5 - Fundamentals of Pipeline **(05)**
Introduction to Pipelining, The Major Hurdle of Pipelining: Pipeline Hazards, linear pipeline and Nonlinear pipeline, MESI protocol.

Unit 6 - Instructions –Level Parallelism **(07)**
ILP: Concepts and challenges, Basic Compiler Techniques for exposing ILP, Reducing Branch costs with prediction, Overcoming Data hazards with Dynamic scheduling, Hardware based Speculation, Exploiting ILP using multiple issues and static scheduling

Unit 7 - Multiprocessors and Thread –Level Parallelism: **(05)**
Introduction, Symmetric Shared-Memory architectures, Performance of symmetric shared–memory multiprocessors, Distributed shared memory and Directory-based coherence.

Internal Continuous Assessment (ICA):
ICA shall consist of minimum six to eight assignments based on entire curriculum.

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, Fuzzy Sets, uncertainty and information, PHI India.
2. Robert J. Schiling, SandraL.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, Fuzzy Sets and their applications – Pragati Publications.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Second Year B.Tech (Computer Science and Engineering)

Semester-IV

CSEPCC-05: THEORY OF COMPUTATION

Teaching Scheme	**Examination Scheme**
Lectures–2 Hours/week,2 credits	ESE–70 Marks
Tutorial–1 Hour/week, 1credit	ISE – 30Marks
	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.

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 introduce different types of automata.
3. To explain regular and non-regular languages.
4. To introduce context free grammar.
5. To introduce different types of Pushdown automata and Turing machine.

Course Outcome:

Students will be able to

1. Build regular expressions for a given language.
2. Design different types of automata.
3. Classify languages as regular and non-regularlanguages.
4. Detect ambiguity in a grammar and convert into unambiguous grammar and normal forms.
5. Design pushdown automata and Turing machines for a given language.

SECTION-I

UNIT-1 Regular Expressions (06)

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

UNIT-2 Finite Automata (10)

Finite automata definition and representation, Non-deterministic F.A., NFA with^ transitions, Equivalence of DFA & NFA, Kleen's theorem: Statements & proofs, minimizing number of states in an FA, Basics of Moore and Mealy Machines

UNIT– 3 Grammars & Languages (07)

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– 4 Pushdown Automata **(06)**

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

UNIT– 5 CFL's & Non CFL's **(05)**

Pumping Lemma & examples, intersection and complements.

UNIT– 6 Turing machines **(07)**

Models of computation, definition of TM as language Acceptors, Combining Turing machines

UNIT-7 Variations in TM **(04)**

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 Kleenstheorm
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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References:

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 &PremNath, Khanna Publications

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

CSEPCC-06: COMPUTER NETWORKS

Teaching Scheme	**Examination Scheme**
Lectures–3 Hours/week,3 Credits	ESE – 70 Marks
Practical–2 Hour/week,1 Credit	ISE – 30 Marks
	ICA – 25 Marks
	POE - 25 Marks

Introduction:
This course introduces OSI reference model and TCP/IP protocol in detail and it also covers the IPv4 Addressing, Socket Programming, Transport layer and Application layer protocols.

Course Prerequisite: Students should have the knowledge of Basics of Computer Networks and networking devices.

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 OSI reference model and TCP/IP protocol suite for Network-communication.
2. Identify the different classes of IP address for network set-up.
3. Implement client-server paradigm using transport layer protocols.
4. Select and use appropriate Application Layer Protocols for a given problem.

SECTION-I

UNIT-1 Basics of Computer Networks **(08)**
OSI Reference model, TCP/IP protocol, Internet Protocol: Introduction, Addressing: Physical, Logical, Port& Application Specific Addresses. Introduction To IPv4 Addresses: Classful addressing, Classless addressing, Special addresses, NAT

UNIT-2 Transport Layer **(07)**
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

UNIT-3 Client Server Model and Socket Interface **(08)**
Client Server Paradigm: Server, Client, Concurrency, Concurrency in Clients, Concurrency in Servers, Socket, Byte Ordering Functions. Connectionless Iterative Server.

SECTION-II

UNIT-4 Host Configuration & Domain Name System (07)

HostConfiguration: BOOTP Operation, Packet format, DHCP: Introduction, DHCP Operation and Configuration.

Domain Name System: Need for DNS, Name Space, DNS on the Internet, Resolution, DNS Messages, Types of Records.

UNIT-5 Remote Login and TELNET (07)

TELNET Concept, Time-Sharing Environment, Network Virtual Terminal, Controlling the Server, Out-of-Band Signaling, Escape Character, Mode of Operation

SSH:Components, Port Forwarding, Format of SSH Packets.

UNIT-6 File Transfer and Electronic Mail (08)

FTP: Introduction**,** control & data connections, Communication over data and control connection, Command Processing

TFTP: Messages, Connection, Data Transfer, UDP Ports, TFTP Applications.

Electronic Mail: Architecture, UserAgent, Message Transfer Agent, SMTP, Message Access Agent: POP and IMAP

Internal Continuous Assessment(ICA):

Students should perform a minimum of 8 experiments based on the following guidelines and preferably conducted on a Unix/Linux platform using C language.

1. Configuration of Network-Assigning IP Address, Subnet-Mask, Default Gateway, DNS Server Addresses & Testing Basic Connectivity.
2. Connectionless Iterative Server: C Implementation of Client-Server Programs Using Iterative UDP Server.
3. Connection-oriented Iterative Server: C Implementation of Client-Server Programs Using Iterative TCP Server.
4. Connection-oriented Concurrent Server: C Implementation of Client-Server Programs Using Concurrent TCP Server.
5. Implementation of Simple Network Chatting Application.
6. Remote Login : TELNET
   a) Logon to a remote computer from a client using TELNET.
   b) After logging on executes few commands at remote server from client. For example user wants a server to display a file (hello.txt) on a remote server then he/she types: *cathello.txt*.
   c) Logon to a remote computer from a client using TELNET and Putty terminal emulator. After logging on execute few commands. Here Client and Server are on heterogeneous systems, for example client is on windows and server is on Linux.
7. Remote Login : SSH
   a) Log on to a remote computer from client using SSH.
   b) After logging on executes few commands at remote server from client. For example user wants a server to display a file (hello.txt) on a remote server then he/she types:*cathello.txt*.
   c) Log on to a remote computer from client using SSH and Putty terminal emulator.After logging on execute few commands. Here Client and Server are on heterogeneous systems for example client is on windows and server is on Linux.
8. Installation and configuration of DHCP
9. Installation and configuration of FTP.

Text Books:

1. TCP/IP Protocol Suite:BehrouzA.Forouzan (Fourth Edition) (Unit 1,2,3,5,6)
2. TCP/IP Protocol Suite:BehrouzA.Forouzan (Third Edition) (Unit 4)
3. TCP/IP Protocol Suite:BehrouzA.Forouzan (Second Edition) (Unit 3)
4. ComputerNetworking:ATop-Down Approach Featuring the Internet, International Edition: James F.Kurose and Keith W.Ross

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Reference Books:

1. Internet working with TCP/IPVol. III.Client-Server Programming & Applications : Douglas E. Comer
2. Data and Computer Communications :William Stallings
3. Data Communication and Networking : BehrouzA.Forouzan
4. Computer Networks, M.Dave,Cengage
5. An Engineering Approach to Computer Networking, Keshav,Pearson
6. An Integrated Approach to Computer Networks, BhavneetSidhu, Khanna Publications
7. Telecommunication Switching System and Networks,Viswanathan,PHI

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Second Year B.Tech. (Computer Science & Engineering)
Semester – IV
CSESEC-01: Object Oriented Programming using JAVA

Teaching Scheme	**Examination Scheme**
Lectures: 1 Hr/Week, 1 Credit	ICA: 25 Marks
Practical: 2 Hrs/Week, 1 Credit	POE: 25 Marks

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

Course Prerequisite:
Students must be familiar with basic programming languages like C.

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 givenproblem.
3. Test and debug a Java program for a given problem.

SECTION-I

Unit 1 - Basics of Java and Strings in Java (02)
Basics: Java Runtime Environment (Oracle JDK, OpenJDK), Naming Conventions and Javaprofilers.Basics: Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input andOutput, Data Types, Arrays, Type Casting.
Fundamentals: String Class and Methods, Immutability of Strings, String Buffer Class and Methods,String Builder class and Methods.

Unit 2 - Introduction to OOPs (04)
Objects and Classes, Fields and Methods, Abstraction, Encapsulation, Inheritance, Polymorphism,Type Compatibility and Conversion, Overriding Methods, Access control, Modifiers, Constructors,Abstract classes, Nested classes, Packages, Wrapper classes, Interfaces, Object Life time &GarbageCollection.

Unit 3 - Exceptions, Error Handling and Basic IO (06)
Exceptions and Error Handling: Exceptions and Errors, Catching and Handling Exceptions, The tryBlock, The catch Blocks, The finally Block, Throwing Exceptions, Chained Exceptions,CustomExceptions. JUnit Testing Framework.Basic I/O: I/O Streams, Byte Streams, Character Streams, Buffered Streams, Scanning andFormatting, Data Streams, Object Streams, File I/O Classes: Reading, Writing, and Creating Filesand Directories

Unit 4 - Java Collections Framework (06)
Introduction, The Arrays Class, Searching and sorting arrays of primitive data types, Sorting Arraysof Objects, The Comparable and Comparator Interfaces, Sorting using Comparable &Comparator,Collections: Lists, Sets, Maps, Trees, Iterators and Collections, The Collection Class.

Unit 5 - Multithreading and Networking **(06)**

Multithreading: Creating Threads, Thread scheduling and priority, Thread interruptions andsynchronization.Network Programming: InetAddress, URLs, Socket (TCP & UDP) communication in Java, ServletProgramming

Unit 6 - GUI Programming **(03)**

GUI Programming using Swing: Swing package, Layouts, Events, Listeners and Eventhandling, 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 15 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 recommended to enhance hands on skills in Java Programming of Students.

Text Books:

1. Head First Java, Kathy Sierra, Bert Bates, O'Reilly Publication
2. The JavaTM Programming Language, Ken Arnold, James Gosling, David Holmes, Pearson Publication
3. Core Java for Beginners, RashmiKanta Das, Vikas Publishing House Pvt Ltd.
4. Programming with Java, Balaguruswamy, TMH
5. Internet and Java Programming, TanweerAlam, 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. Head First Servlets and JSP – Bryan Bosham, Kathy Sierra, Bert Bates, O'Reilly Publication
4. The JavaTM Tutorials. Oracle Inc.
5. Java Server Programming for Professionals - Ivan Bayross, Sharanam Shah, Cynthia Bayross and Vaishali Shah, Shroff Publishers and Distributors Pvt. Ltd, 2nd Edition

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e-resources :

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

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Second Year B.Tech. (Computer Science & Engineering)

Semester – IV

EM-02: Project Management and Economics

Teaching Scheme	**Examination Scheme**
Lectures: 2Hr/Week, 2Credits	ISE: 25 Marks
	ICA:25 Marks

Course Outcomes:

On completion of the course students will be able to:

1. Demonstrate decision making and communication as a member of a team as well as Lead a team for effective management of construction projects.
2. Apply the Optimization techniques for decision making in construction industry.
3. Carry out ABC analysis, Break even analysis and calculate EOQ and Inventory costs for construction project.
4. Demonstrate the decision making abilities based on economics in projects and to appraise alternative projects.

SECTION I

Unit 1: (06)

Definition and Functions of Management; Planning: Process of planning, Management by objectives; Organizing: Formal and informal organization, centralization, decentralization, line, line and staff, functional organization; Leading, directing, controlling and coordination; Communication process, motivation.

Unit 2: (10)

Importance of Decision Making, steps in decision making.

Decision under certainty: Linear Programming, Formulation of simple L-P model, Graphicalmethod, Duality.Application of Linear Programming in 'Transportation Problems': North-West corner method,Least cost method, Vogel's Approximation method (Only Initial Basic Feasible Solution) andApplication of Linear Programming in 'Assignment problems'

Unit 3: (04)

Decision under uncertainty: Wald's, Savage, Hurvitz and Laplace criterion of optimism and regret, expected monitory value, Theory of games (dominance pure and mixed strategy).

SECTION II

Unit 4: (07)

Inventory control: Introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks. Break even analysis.

Unit 5 (07)

Engineering economics: Importance, demand and supply, types of costs, Interest-Simple, compound, continuous, and effective interest. Value of money - time and equivalence, tangible and intangible factors, Introduction to inflation. Cash flow diagram.

Unit 6 (06)

Economic comparisons: Discontinuing methods- Present Worth method, equivalent annual cost method, capitalized cost method, Net Present Value, Internal Rate of Return and Benefit Cost ratio. Non discontinuing criteria: Payback and urgency criteria.

In Semester Evaluation (ISE)
ISE shall be based upon students' performance in minimum three tests conducted and evaluated at institute level.

Internal Continuous Assessment (ICA)
Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on the entire curriculum.

Text Books :

1. A Textbook of Organizational Behaviour, CB Gupta, S. Chand Publications
2. Construction Engineering & Management, S.C. Sharma & S.V. Deodhar, Khanna Book Publishing
3. Optimization Techniques, S.S. Rao, Wiley Eastern India
4. Operation Research, Hamdy A. Taha, Operation Research, Prentice Hall of India, New Delhi 8th Ed.2011
5. Store Management, Menon K. S., Store Management, McMillan Co. New Delhi, 2nd Ed. 1998.
6. Principles of Construction Management: Roy Pilcher , Tata McGraw Hill Publications.
7. Principles of Engineering Economy- E. L. Grant, W. G. Ireson, R. S. Leavenworth, Wiley International Education, 7th Ed.

Reference Books :

1. Total Quality Management, Ponia& Sharma, Khanna Publishing House, Delhi
2. Engineering Management: Industrial Engineering & Management, S.C. Sharma, Khanna Publishing House, Delhi
3. Principles and Practice of Management, Prasad, L.M, Sultan Chand
4. Organizational Behaviour, L.M. Prasad, Sutan Chand and Sons.
5. Handbook of Construction Management, Joy PK, Macmillan
6. Construction Project Management, Jha, Pearson
7. Total Quality Management, Gopal, PHI Publications
8. Industrial Engineering & Operations Management, S.K. Sharma. S.K. Kataria& Sons
9. Principles of Operation Research: Prentice Hall of India, 2nd Ed.1925,Wagner H. M.
10. Operation Research: Shaum's outline series, Richard Bronson Govindsami N., Tata McGrawHill , 2nd Ed.2004
11. Material Management, Gopal Krishnan, Sudeshan,
12. Engineering Economics - L.P. DeGarmo, W.G.Sullivan, J.A.Bantadelli, McMillan India Co. New Delhi, 8th Ed. 1984.
13. Manual of Construction Project Management- S. K. Guha, Thakurti, K. R. Shah, MultiTech Publishers.
14. Management Information System- Gupta R.C., CBS, New Delhi.
15. Value Engineering in the Construction Industry: Dell'lsola, A. J., Construction Publication Company.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Second Year B.Tech. (Computer Science & Engineering)

Semester – IV

VEC-01: Professional Ethics

Teaching Scheme	**Examination Scheme**
Lectures: 1Hr/Week, 1 Credit	ESE: 50 Marks
Practical: 2 Hr/Week, 1 Credit	ICA: 25 Marks

Course Outcomes:

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

1. Inculcate the human values in their behavior.
2. Demonstrate the Engineering ethics in their professional practice.
3. Practice the safety and responsibility and professional rights in their professional practice.
4. Incorporate the code of ethics of Global organizations such as ASME, ASCE, and IEEE

Unit 1:

Human Values Morals, Values and Ethics, Integrity, Work Ethics, Service Learning, Civic Virtue, Respect for others, Living Peacefully, Caring, sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character, spirituality

Unit 2:

Engineering Ethics Senses of engineering ethics, Variety of Moral Issues, Types of inquiry, Moral Dilemmas Moral Autonomy, Kohlberg's Theory, Gilligan's Theory, Consensus and Controversy, Models of Professional Roles, Theories about Right Action, Self Interest , Customs and Religion.

Unit 3:

Safety, Responsibilities and Rights Safety and Risk, Assessment of safety and Risk, Risk Benefit Analysis and Reducing Risk, The Three Mile Island and Chernobyl Case Studies. Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Whistle Blowing, Professional Rights – Employee Rights, Intellectual Property Rights (IPR) – Discrimination.

Unit 4:

Global Issues Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Sample Code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), etc.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text Books :

1. Bayles, M.D.: Professional Ethics, California: Wadsworth Publishing Company, 1981.
2. Koehn, D.: The Ground of Professional Ethics, Routledge, 1995.
3. R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Second Year B.Tech. (Computer Science & Engineering)

Semester – IV

Environmental Science

Teaching Scheme **Examination Scheme**

Lectures: 1 Hr/Week, 1 Credit ESE: 40 Marks

ISE: 10 Marks

Unit 1: Introduction to environmental studies (2 lectures)

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development

Unit 2 : Ecosystems (6 lectures)

- What is an ecosystem? Structure and function of ecosystem;
- Energy flow in an ecosystem: food chains, food webs and ecological succession.
- Case studies of the following ecosystems :

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3: Natural Resources: Renewable and Non-•-renewable Resources (8 lectures)

- Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-•-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-•-state).
- Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit4:Biodiversity and Conservation (8lectures)

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots. India as mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wild life, man- -wildlife conflicts, biological invasions; Conservation of biodiversity: In – situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit5: Environmental Pollution (8lectures)

Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution

- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

Unit6: Environmental Policies &Practices (7lectures)

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act, Air(Prevention, & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit7:Human Communities and the Environment (6lectures)

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit 8:Fieldwork (Equalto3 lectures)

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-•-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-•-pond, river, dam, pond, ocean / marine etc.

Suggested Readings:

1. Environmental Studies E - Text Book (Marathi and English Medium) Solapur University,2017
2. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
3. Gadgil, M., &Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
4. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
5. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
6. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.