SHIVAJI UNIVERSITY KOLHAPUR

REVISED SYLLABUS AND STRUCTURE

SECOND YEAR (B. Tech) CBCS

Computer Science and Engineering

To be introduced from the academic year 2019-20 (i.e. from June 2019) onwards

(Subject to the modifications will be made from time to time)

SECOD YEAR COMPUTER SCIENCE AND ENGINEERING - CBCS PATTERN																					
SEMESTER - IV																					
		TEACHING SCHEME									EXAMINATION SCHEME										
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERMWORK		
Sr. No.	Course Subject / Title	Credits	N0. Of Lectures	Hours	Credits	No. of Hours	Hours	Credits	No. of Hours	Hours	Hours	mode	marks	Total Marks	MIN.	Hours	MAX	MIN.	Hours	MAX	MIN.
1	PCC-CS401 Automata Theory	3	3	3								CIE	30	100	40	AS PER BOS GUIDELINES			AS PER BOS GUIDELINES		
												ESE	70								
2	PCC- CS402 Computer Networks - II	3	3	3				1	2	2		CIE	30	100	40		50	20		25	10
												ESE	70								
3	PCC- CS403 Computer Organization and Architecture	3	3	3								CIE	30	100	40						
												ESE	70								
4	PCC- CS404 Operating Systems - I	3	3	3				1	2	2		CIE	30	100	40					25	10
												ESE	70								
5	PCC- CS405 Software Engineering	3	3	3								CIE	30	100	40						
												ESE	70								
6	PCC- CS406 Object Oriented Programming	2	2	2				2	4	4							50	20		50	20
7	PW- CS407 Mini Project							1	2	2							50	20		50	20
8	MC-CS408 Environmental Studies	2	2	2	1	1	1					CIE ESE	30 70	100	40						
	Total (SEM –IV)	***19***	***19***	***19***	***1***	***1***	***1***	***5***	***10***	***10***				***600***			***150***			***150***	
	Total	**37**	**37**	**37**	**3**	**3**	**3**	**10**	**20**	**20**				**1100**			**275**			**325**	

CIE- Continuous Internal Evaluation

ESE – End Semester Examination

• Candidate contact hours per week : 30 Hours (Minimum)	• Total Marks for S.E. Sem III & IV : **800 + 900 =1700**
• Theory and Practical Lectures : 60 Minutes Each	• Total Credits for S.E. Sem III & IV : **50 (SEM-III: 25 + SEM -IV: 25)**
• In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.	
• There shall be separate passing for theory and practical (term work) courses.	

Note:

1. **BSC-CS**: Basic Science Course – Computer Science and Engineering are compulsory.
2. **ESC-CS:** Engineering Science Course - Computer Science and Engineering are compulsory.
3. **PCC-CS:** Professional Core Course – Computer Science and Engineering are compulsory.
4. **HM-CS:** Humanities and Management- Computer Science and Engineering are compulsory.
5. **PW-CS:** Project Work-– Computer Science and Engineering are compulsory.
6. **MC-CS:** Mandatory Course -Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.

S. Y. B. Tech (Computer Science and Engineering) Sem – IV

1. Automata Theory (PCC-CS-401)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : ---	**Term work:** ---
Practical: ---	**Practical :** ---

Prerequisite: Basic Mathematical Concepts, Sets, graphs. **Course Objectives:**

1. To introduce students to the mathematical foundations of computation, the theory of formal languages and grammars
2. To strengthen the students' ability to understand and conduct mathematical proofs for computations
3. To make the students understand the use of automata theory in Compliers & System Programming.
4. To analyze and design finite automata, pushdown automata, grammars & Turing machines

Course Outcomes:

Upon successful completion of this course, the student will be able to –

1. Understand basic concepts of Regular Language and Regular Expressions
2. Select appropriate abstract machine to recognize a given formal language.
3. Generate complex languages by applying Union, Intersection, Complement, Concatenation and Kleene * operations on simple languages.
4. Apply parsing concepts for syntax analysis.
5. Be familiar with thinking analytically and intuitively for problem solving situations in related areas of theory in computer science.

Unit No	Contents	No. of Lectures
1	**Regular Languages and Finite Automata** Proofs, Recursive Definitions, Regular expressions and regular languages, Finite Automata, unions, intersection & complements of regular languages, Applications of FA	7
2	**Nondeterminism and Kleene's Theorem** Nondeterministic finite automata, NFA with null transition, Equivalence of FA's, Kleene's Theorem (Part I & Part II), Minimal Finite Automata	6
3	**Context free Grammars** Definition, Union, Concatenation and Kleene *'s of CFLs, Derivation trees and ambiguity, Simplified forms and normal forms	5

4	**Parsing and Pushdown Automata** Definition of Pushdown Automata, Deterministic PDA, Equivalence of CFG's & PDA's, Top down parsing, bottom up parsing.	6
	Context free languages	
5	CFL's and non CFL's**,** Pumping Lemma, intersections and complements of CFLs	5
	Turing Machines	
6	Definition, TM as language acceptors, combining Turing Machines**,** Computing partial function with a TM, Multi-tape TMs, and Universal TM	7

Text Books:

1. Introduction to Languages & the Theory of Computations - John C. Martin (Tata MGH Edition)
2. Discrete Mathematical Structures with applications to Computer Science - J .P. Trembley & R. Manohar (MGH)

Reference Books:

1. Introduction to Automata Theory, Languages and computation - John E. Hopcraft, Raje
2. Motwani, Jeffrey D. Ullman (Pearson Edition)
3. Introduction to theory of Computations - Michael Sipser (Thomson Books/Cole)
4. Theory of Computation - Vivek Kulkarni

S. Y. B. Tech (Computer Science and Engineering) Sem – IV

2. Computer Networks-II (PCC-CS-402)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : ---	**Term work:** 25 marks
Practical: 2 Hrs/Week	**Practical :** 50 Marks

Prerequisite: Computer Network-I.

Course Objectives:

1. To understand the Client server model & socket interface
2. To perceive IPv6 addressing and protocol
3. To explain and learn basic internet technology protocols
4. Simulate protocols using software tools.

Course Outcomes:

Upon successful completion of this course, the student will be able to –

1. program the client server model using sockets
2. understand and apply next generation protocol and addressing model
3. elaborate the fundamentals of Domain Name Systems
4. apply the concepts of Remote login and FTP in network applications
5. learn fundamentals of web, HTTP and e-mail communication protocols.
6. understand multimedia streaming and relevant protocols.

Unit No	Contents	No. of Lectures
1	**Client server model & socket interface:** The Socket Interface, The Client Server model and Software design, Concurrent processing in client-server software, Algorithms and issues in Client-Server design, Multiprotocol Servers, Multiservice Servers, Concurrency in clients, Unix Internet Super server (inetd).	6
2	**Next Generation IPv6 and ICMPv6:** IPV6 addresses, packet format, ICMPV6, Transaction from IPV4 to IPV6	5
3	**BOOTP, DHCP and Domain name system:** Name Space, Domain Name Space, Distribution of name space, and DNS in internet, Resolution, DNS massages, Types of records, Compression examples, and encapsulation. BOOTP, DHCP	6

4	**Remote Login: TELNET and File Transfer FTP, TFTP:** Concept, NVT, Embedding, Options & options/sub-option negotiation, controlling the server, Out-of-band signaling, Escape charter, Mode of operation, user interface. **FTP:** Connections, Communication, Command processing, File transfer, User interface, Anonymous FTP, TFTP.	6
5	**Web Applications Service Protocols:** HTTP: Architecture, Web Documents, HTTP Transaction, Request and Response, HTTP Headers and Examples, Persistent Vs Non- Persistent HTTP, Proxy servers. **Electronic Mail:** Architecture, User agent, addresses, Delayed delivery, SMTP commands and responses, Mail transfer phases, MIME, POP3	7
6	**Multimedia In Internet:** Streaming stored audio/video, Streaming live audio/video, Real time interactive audio/video, Real Time Transport Protocol (RTP), Real Time Transport Control Protocol (RTCP), Voice Over IP (VoIP), Session Initiation Protocol (SIP)	6

Text Books:

1. TCP/IP Protocol Suite by Behrouz A. Forouzan McGraw-Hill Publication, 4th Edition.
2. Computer Networks by Andrew S Tanenbaum.

Reference Books:

1. Data Communications and Networking by Behrouz A Forouzan
2. Internetworking with TCP/IP by Douglas Comer
3. Computer Networking: A Top-Down Approach by Jim Kurose

Term work:

It should consist of minimum 8 - 10 experiments based on the following guidelines

1. Client program using UDP to connect to well known services (echo, time of the day service etc.).
2. Implementing concurrent TCP multiservice client/server.
3. Implementing Iterative UDP client/server.
4. Study of following DNS Tools with all its options. nslookup, dig, host, whois.
5. Implement trivial file transfer protocol (TFTP).
6. Configuration of basic services for FTP, HTTP, Telnet etc. on Linux Platform
7. Write program to send a mail using SMTP commands and receive a mail using POP3 commands.
8. Capturing & Analyzing operation of various application layer protocols using network protocol analyzer. (Wireshark and tcpdump)
9. Study of various streaming multimedia protocols in Internet (Using various audio/video streaming services on the Internet)

S. Y. B. Tech (Computer Science and Engineering) Sem – IV

3. Computer Organization and Architecture (PCC-CS-403)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : ---	**Term work:** ---
Practical: ---	**Practical :** ---

Prerequisite: Basic Computer and Microprocessor

Course Objectives:

1. To provide a high-level overview of Computer organization.
2. To discuss the basic of I/O addressing and access.
3. To make the students aware of overall design and architecture of computer and its organization.
4. To analyze performance issues in processor and memory design of a digital computer.

Course Outcomes:

Upon successful completion of this course, the student will be able to –

1. recapitulate the history of computer system and the basic concepts of computer architecture and organization.
2. understand the concept of I/O organization.
3. apply the different algorithms to perform arithmetic operations.
4. articulate the design issues in the development of processor.
5. conceptualize instruction level parallelism.
6. understand the concept of memory techniques.

Unit No	Contents	No. of Lectures
1	**Computer Evolution and Performance** Evolution of computer – Mechanical Era: Babbage's Difference Engine, Electronic Era: First generation, IAS Computers, Instruction Set and Instruction Execution, Second generation, Input-Output Operation, Programming Language, Third generation and VLSI Era - IC Circuits, Performance Consideration and Measures, Speed up Techniques, Difference between RICS and CISC.	5
2	**Input and Output Organization** Accessing I/O devices, Direct Memory Access (DMA), Buses: Synchronous Bus and Asynchronous Bus, Interface Circuits, Standard IO Interface.	6
3	**Arithmetic** Addition and Subtraction of Signed Numbers, Design of fast Adders, Multiplication of Positive numbers , Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating Point Number Operations: IEEE 754 Floating Point Format, Arithmetic Operations	8
4	**The Processing Unit** Some fundamental Concepts, Execution of complete Instruction, Multiple bus	6

	organization, Hardwired control, Micro programmed Control **Pipelining**	
5	Basic Concepts: Role of Cache Memory, Pipeline Performance. Data Hazards: Operand Forwarding, Handling Data Hazards in Software and Side Effects and Instruction Hazards: Unconditional Branches and Conditional Branches and Branch Prediction	5
	Computer Memory System	
6	Some Basic Concepts, Types of Memories :ROM and RAM, Semiconductor RAM memory, Cache Memories: Mapping functions, Replacement Algorithms, Example of Mapping Techniques	6

Text Books:

1. Computer Architecture and Organization-John P Hayes (MGH) 3rd Edition
2. Computer Organization – Carl Hamacher, Zvonko Vranesic and Safwat Zaky . Publisher: Tata McGraw Hill. 5th Edition.

Reference Books:

4. Computer Systems Organization & Architecture – John D. Carpinelli (Pearson Education)
5. http://cse.stanford.edu/class/sophomore-college/projects-00/risc/risccisc/(RISC vs. CISC)
6. http://www.cpu-world.com/sspec/

S. Y. B. Tech (Computer Science and Engineering) Sem – IV

4. Operating System I (PCC-CS-404)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : ---	**Term work:** 25 marks
Practical: 2 Hrs/Week	**Practical :** ---

Prerequisite: Computer Network-I.

Course Objectives:

1. To make the students understand basic concepts of operating system
2. To expose the students to various functions of the Operating system and their usage
3. To give hands on exposure to Linux commands and system calls.

Unit No.	Contents	No. of Lectures
1	**Overview of OS** Abstract view of an operating system,Fundamental principles of OS operations, OS interaction with the computer and user programs, Efficiency ,system performance and user service,Batch Processing System, Multiprogramming System, The Time Sharing System, The Real Time Operating System, Distributed operating system, Operation of OS, Operating system with monolithic structure,Virtual machine operating system, Kernel based operating system, Microkernel based operating system	6
2	**Processes, Threads and Synchronization** Processes and programs,Implementing processes, Threads, Process synchronization, Race condition, Critical Section, Synchronization approaches, Classic process synchronization problems, Semaphores, Monitors	6
3	**Process Scheduling** Scheduling terminology and concepts, Non preemptive scheduling policies, Preemptive scheduling policies, Long, Medium and short term scheduling	6
4	**Deadlock** What is deadlock, Deadlock in resource allocation, Handling Deadlocks : Deadlock Detection and Resolution, Deadlock prevention, Deadlock avoidance	6
5	**Memory Management** Managing the memory hierarchy, Static and Dynamic Memory Allocation, Heap Management, Contiguous Memory Allocation and Non Contiguous Allocation, Segmentation and Segmentation with paging, Virtual memory basics, Demand paging, Page replacement policies	6

6	**File systems and I/O systems** Overview of file processing, Files and file operations, Fundamental file organizations and access methods, Layers of the Input Output control system, Overview of I/O system	6

Text Books:

1. Operating Systems -A Concept Based approach -Dhananjay M Dhamdhere (TMGH).3rd edition.
2. Operating System Concepts -Abraham Silberschatz, Peter B. Galvin & Grege Gagne (Wiley)

Reference Books:

1. UNIX Concepts and Applications –Sumitabha Das (TMGH).
2. Operating System: Concepts and Design -Milan Milenkovic (TMGH)
3. Operating System with case studies in Unix, Netware and Windows NT -Achyut S. Godbole (TMGH).

Term work:

The tutorials should be conducted on the following guidelines.

1. Six assignments should be based on theoretical / analytical concepts, preferably from the exercises of the books covering all topics of the syllabus.
2. Four assignments should on usage of Unix / Linux commands and system calls concerned with General purpose utilities, file system, handling ordinary files, basic file attributes, the Shell, the Process and Filters using regular expressions as mentioned in the reference book at serial no. 1.
3. Installation of any two operating system using VMware.

These assignments should be practically conducted during the tutorial sessions.

S. Y. B. Tech (Computer Science and Engineering) Sem – IV

5. Software Engineering (PCC-CS-405)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**Theory :** ESE 70 Marks CIE 30 Marks
Tutorial : ---	**Term work:** ---
Practical: ---	**Practical :** ---

Course Objectives:

1. To expose the students to basic concepts & principles of software engineering.
2. To make the student aware of the importance of SDLC in their project development work.
3. To expose the students to software testing techniques and software quality management.

Course Outcomes:

1. Comprehend systematic methodologies of SDLC(Software Development Life Cycle)
2. Discriminate competing and feasible system requirements indicating correct real world problem scope and prepare stepwise system conceptual model using stakeholder analysis and requirement validation.
3. Prepare SRS document for a project
4. Apply software design and development techniques
5. Develop a quality software project through effective team-building, planning, scheduling and risk
6. Understand testing methods at each phase of SDLC

Unit No.	Contents	No. of Lectures
1	**The software Problem** Cost, Schedule & Quality, Scale and Change, Software Processes: Process & Project, Component Software Processes, Software Development process Models, Project Management Process.	6
2	**Software Requirements Analysis & specification** Value of Good SRS, Requirement Process, Requirements Specification, Other Approaches for Analysis ,Validation	5
3	**Software Planning & Scheduling** Responsibilities of Software Project Manager, Project Planning, Project Scheduling, Project Staffing, People CMM, Risk Management	6
4	**Design** Design Concepts, Function Oriented Design, Object Oriented Design, Detail Design,Verification,Metrics	6

5	**Coding & Testing** Coding & Code Review,Testing, Unit Testing,Black Box ,Testing,White Box Testing, Program Analysis Tools, Integration Testing, System Testing	7
6	**Software Reliability & Quality Management** Reliability,Software Quality,Software Quality Management System, ISO 9000, SEI capability Maturity Model, Six Sigma, Agile Software Development & Extreme Programming, Agile Project Management	6

Text Books:

1. Software Engineering: A precise Approach - Pankaj Jalote (Wiley India) (Unit 1,2,4).
2. Fundamentals of Software Engineering – Rajib Mall (3rd Edition)(PHI) (Unit 5, 6).
3. Software Engineering by Jan Sommerville (9th Edition) Pearson (Unit 6, 7 & 6.8).
4. Software Engineering Principles & Practices by Rohit Khurana ITLESL (2nd Edition) Vikas Publishing House Pvt. Ltd. (Unit 3).

Reference Books:

1. Software Engineering - Concepts & Practices -- Ugrasen Suman (Cenage Learning)
2. Software Engineering Fundamentals -- Behforooz & Hudson (Oxford: Indian Edition 1st)

S. Y. B. Tech (Computer Science and Engineering) Sem – IV

6. Object Oriented Programming (PCC-CS406)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs/Week	**Theory :** ---
Tutorial : ---	**Term work:** 50 marks
Practical: 4 Hrs/Week	**Practical :** 50 marks

Pre- requisites: Basics Of C Programming Language

Course Objectives:

1. To learn advanced features of the C++ programming language as a continuation of the previous course.
2. To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
3. To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
4. To enhance problem solving and programming skills in C++ with extensive programming projects.
5. To become familiar with the LINUX software development environment.

Course Outcomes:

After the completion of this course, a successful student will be able to do the following:

1) Use the characteristics of an object-oriented programming language in a program.
2) Use the basic object-oriented design principles in computer problem solving.
3) Use the basic principles of software engineering in managing complex software project.
4) Program with advanced features of the C++ programming language.
5) Develop programs in the LINUX programming environment.

Unit No.	Contents	No. of Lectures
1	**Basics of Object Oriented Programming** The Origins of C++,Features of Object Oriented Programming, relations of Classes & Structures, Classes & Objects, Encapsulation, Data Abstraction, Inheritance, Inline Function, Constructor &Destructor ,function overloading & Operator overloading, Static class member, Static Member Function, Scope resolution Operator, Access members Data member & member Function, Defining member functions, Passing Object to Functions, Nested classes, local classes, Friend functions, Friend class	5
2	**Pointers , Arrays, Dynamic allocation Operator** Arrays Of Object, Pointers to Object, THIS pointer, type checking C++ Pointers, Pointers to Derived types, Pointers to Class members Dynamic Allocation Pointers :-New & Delete Operator	3
3	**Functions & Operator Overloading** Functions Overloading, Operator Overloading, Types Of Constructors, Destructors, Operator Overloading Using Friend Function, Unary & Binary Operator Overloading(Arithmetic, Comparison Operator Overloading),Assignment Operator Overloading(=,+=)	4
4	**Inheritance & Virtual Function** Inheritance, Single Inheritance, Types of Derivations, Passing parameters to base ,Multiple Inheritance, Multilevel Inheritance, Hybrid Inheritance ,Hierarchical Inheritance , Virtual function, Calling a Virtual function through a base class reference, Virtual functions are hierarchical, Pure virtual functions, Abstract classes, Early and late binding.	5
5	**Templates & Exception handling** Function Template ,Class Template, Generic Classes ,Generic Functions, Applying Generic Functions Type Name, export keyword Power of Templates Standard Template Library (STL):-STL Container, STL Algorithm, STL iterator. Exception handling :-Exception handling fundamentals, Catching, Throwing ,& Handling Exception, Exception handling options,	5

6	**I/O System Basics, File I/0** Streams ,File Pointers & Redirections Streams, C++ stream, C++ Predefined stream classes, Formatted I/O, C++ file I/O, manipulators, fstream and the File classes, File operations, namespaces, std namespaces	4

TERM WORK:

- It should consist of minimum 10-12 experiments based on the syllabus and concepts mention below. Students of different batches should implement different programs based on the following guidelines
- Student should perform the Practicals on Linux platform

List of Experiments

1. Classes & objects
2. Constructors & destructors
3. Friend function and Friend class
4. Inline Function, Static data members & member functions,
5. Array, Array of Objects, Pointer to Object, THIS pointer, Dynamic allocation operators (New & Delete)
6. Function overloading, Operator overloading (unary/binary/arithmetic/comparison)
7. Inheritance (multilevel, multiple, hybrid, Hierarchical)
8. Virtual function and Virtual class, early and late binding
9. Generic function & classes
10. STL
11. Exception Handling
12. File handling

TEXT BOOKS:

1. The Complete Reference C++ by Herbert Schild(Tata McGraw Hill) 4th Edition and onwards.
2. Object oriented Programming in C++ by Rajesh K.Shukla(Wiley) India Edition

REFERENCE BOOKS:

1 Object-Oriented Programming with C++ by E. Balaguruswamy. (Tata McGraw-Hill) 6th Edition and onwards
2. Object oriented Programming with C++- by SouravSahay (Oxford) 2nd edition

S. Y. B. Tech (Computer Science and Engineering) Sem – IV

7. Mini Project (PW-CS407)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : ---	**Theory :** ---
Tutorial : ---	**Term work:** 50 marks
Practical: 2 Hrs/Week	**Practical :** 50 marks

Pre-requisites: Knowledge of software engineering and C/C++

Course Objectives:

1. To expose the students to solve the real world problems.
2. To utilize the techniques. Skills and modern Engineering tools for building the project.
3. To follow the methods and tasks as per SDOLC Approach

Course Outcomes:

1. Define the problem statement.
2. Organize, Plan and prepare the detailed project activities.
3. Construct Flowchart, System Architecture based on the project description
4. Implement the solution for their problem.

Platform: - C, C++

Course Contents/Description:-

The Mini Project should be undertaken preferably by a group of 3-4 students who will jointly work together and implement the project. The Mini Project topic should be based on the any one subject concepts that students have studied for their Academic Year. The group will select the project with the approval of the guide and submit the name of the project with a synopsis of the proposed work not more than 02 to 03 pages. In the Synopsis they have to state Flowchart, Usage of the logic, algorithm, functions and suitable data structure for implementing the solution. They have to implement project using C, C++ languages.

S. Y. B.Tech (Computer Science and Engineering) Sem – IV

8. ENVIRONMENTAL STUDIES (PCC-CS408)

	TEACHING SCHEME	EXAMINATION SCHEME
	Theory : 2 Hrs/Week	**Term work:**
	Tutorial : 1 Hr/week	**Theory** 100
	Practical:	**Practical :**

Prerequisite: Basic knowledge about natural process and fundamentals of environment aspects

Course Objectives:

1. To apply measures to protect the environment, to maintain the quality of life.
2. Environmental Education is important in conservation of natural resources and minimize or stops its over exploitation.
3. Design and evaluate strategies, technologies& methods for sustainable management of Environmental system and for the remediation or restoration of degraded environment.
4. Social problems as well as social issues such as population explosion, exploitation on natural resources, Global warming, Acid rain, Ozone layer depletion, various natural disaster and its management, local level environmental problems, Water conservation ,Environmental pollution and throws light on the methods of solution.

Course Outcomes:

Upon successful completion of this course, the student will be able –

1. To develop ability to protect the environment through ecofriendly lifestyle.
2. To give knowledge of natural resource conservation
3. To make able to implement sustainable technologies for environmental restoration
4. To understand environmental related problems, social issues and suggest solution.

SECTION – I

Unit No.	Contents	No. of Lectures
1.	**Nature of Environmental Studies** Definition, Scope and Importance of Environment. Multidisciplinary nature of environmental studies .Need for public awareness	02
2.	**Natural Resources and Associated Problems** Definition and Types of Natural Resources. a) Forest resources: Use and over-exploitation, deforestation, dams' benefits and problems.	06

b) Water resources: Use and over-utilization of surface and ground Water, floods. Drought, conflicts over water.
c) Mineral resources: Usage and exploitation. Environmental effects of Extracting and using mineral resources.
D) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide Problems
E) Energy resources: Growing energy needs, renewable and non-renewable Energy resources, use of alternate energy sources. Solar energy, Wind energy, Hydal energy, Tidal energy, Biomass energy, Nuclear energy.
F) Land resources: Land as a resource, land degradation, man induced Landslide, Soil erosion. Role of individuals in conservation of natural resources

3. **Ecology and Biodiversity** 10

Concept of an ecosystem. Structure and function of ecosystem.-Producers, consumers and decomposers. Food chains, food webs .Energy flow in the ecosystem. Ecological pyramids. Ecological Succession. Introduction, types, characteristics features, structure and function of the following ecosystem :- a)Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes). d)Aquatic ecosystems (rivers, oceans, estuaries).

Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation. Hot Spots of Biodiversity. Endangered and Endemic Species of India. Threats to Biodiversity: - Habitat Loss, Poaching of Wildlife and Man-wild life Conflicts. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

SECTION – II

4. **Environmental Pollution** 06

Definition: Causes, effects and control measures of: Air pollution Water pollution, Marine pollution ,Soil Pollution. Noise pollution, Thermal Pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes Role of a individual in prevention of pollution.

5. **Social Issues and the Environment** 07

Disaster management: Floods, Earthquake, Cyclone Tsunami and Landslides. From Unsustainable to Sustainable Development. Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming , acid rain, Ozone layer depletion
Waste Land Reclamation.

6. **Environmental protection and Environmental field work (mini project)** 09

Environment Protection Act – 1986, Air (Prevention and Control of Pollution)

Act. 1981, Water (Prevention and control of Pollution) Forest Conservation Act. 1980. Act. Wildlife Protection Act. 1972

Environmental Field Project Report

1. Make 5 students group for one project report
2. Submit only one hard copy of Environment Project among 5 students.

(Visit to a local area to document environmental assets River/forest/grassland/hill/mountain. or Visit to a local polluted site Urban/Rural/Industrial/Agricultural or Study of common plants, insects, birds. or Study of simple ecosystems - ponds, river, hill slopes, etc. (Field work is equal to 06 lecture hours))

Textbooks:

1) Dr. Jay Samant, Environmental studies, Shivaji University, Kolhapur.
2) AnubhaKaushik&C.P.Kaushik. Perspectives in Environmental studies, New Age international Publisher,2004.
3) Gouri Suresh, Environmental studies & Ethics, I.K.International Publishing House, Pvt.Ltd.
4) Environmental studies By –Erach Barucha , *Publisher*: Orient BlackSwan; Second *edition* (2013) .

Reference Books:

1. Sharma B.K., 2001, Environmental Chemistry, Goel Publication House, Meerut
2. Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.
4. De A.K., Environmental Chemistry, Wiley Wastern Ltd.
5. Rao M.N.and Datta, A.K.1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd., 345p.
6. Trivedi R.K. and P.K. Gokel, Intriduction to air pollution, Tecgbi-Science Publications (TB)

****