RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FOUR YEAR BACHELOR OF TECHNOLOGY (B.TECH.) DEGREE COURSE
SEMESTER:THIRD(C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)
Subject Name: Mathematical foundations for Data Science
Subject Code:BTECH_CSEDS-301T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs (Theory)	3	1	4	30	70	100

Course Objective:

1	To develop the understanding of theory of probability and its applicability in data science
2	To derive inference by using concepts of sampling theory and testing of hypothesis
3	To formulate mathematical models of real world problems.

Course Outcome:
At the end of this course students are able to:

CO1	Apply the concepts of probability. Understand the random variables and probability functions
CO2	Analyze the data of real world problems using special probability distributions and Mathematical expectations.
CO3	Understand concepts of sampling theory and estimation which is used in the field of data science
CO4	Learn the techniques of testing hypothesis and apply it to test the significance of various data samples.
CO5	Apply the concept of Regression analysis to mathematical model generated by various data samples.

UNIT-I	**Theory of Probability and Mathematical Expectation Probability:** Review of probability of an event, Conditional probability, Baye's rule, Review of discrete and continuous random variables, Joint probability function and Joint probability distribution of DRV, Marginal probability function and Conditional distribution of DRV. **Mathematical Expectation (DRV):** Mathematical expectation, Variance and Standard deviation, Moments, Moment generating function, Expectation, Variance and Covariance of Joint Distribution, Measures of central tendency: Mean, Median, Mode, Skewness and Kurtosis.
UNIT-II	**Special Probability Distributions:** Introduction to discrete and continuous distributions, Geometric distribution, Binomial distribution,Poisson distribution, Normal distribution, Exponential distribution, Uniform distribution.
UNIT-III	**Sampling Theory and Estimation:** Sampling Theory: Definition of population, sampling, static parameter, Types of sampling,Expectedvalues of sample mean and variance, Standard error, Sampling distribution of meanandsampling distribution of variance. Estimation: Estimation of parameters, Point estimation,Interval estimation, Bayesian estimation..

Dr. V.P. Balpande

(Mr. B.P. Dharaskar)

M. Mulchandani

UNIT-IV	**Testing of Hypothesis:** Hypothesis, Null hypothesis, Alternative hypothesis, Testing a hypothesis, Level of significance,Confidence limits, Test of significance of difference of means, t-test, F-test and Chisquaretest, One way and two way Analysis of Variance (ANOVA).
UNIT-V	**Multidimensional Analysis:** Multiple Linear Regression Model: Least square estimation, R^2 and adjusted R^2 coefficients, Problem of multi-colinearity, Regression equation of three variables, Lasso regression, Ridge regression. Factor Analysis: Centroid method, Principal component method. Cluster Analysis: Non-hierarchical clustering, Hierarchical clustering.

Text/ Reference Books:

(1) Advanced Engineering Mathematics (Wiley), Erwin Kreyzig.

(2) Higher Engineering Mathematics (Khanna Publishers), B. S. Grewal.

(3) Advanced Engineering Mathematics (S. Chand), H. K. Dass.

(4) Probability and Statistics (Schaum's Outline Series), Murray Spiegel, John Schiller, R. A. Srinivasan.

(5) Fundamentals of Statistics (Himalaya Publishing House), S. C. Gupta.

(6) Research Methodology Methods and Techniques (New Age Publications), C.R. Kothari, Gaurav Garg.

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SEMESTER:THIRD(C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)
Subject Name: Object Oriented Programming
Subject Code: BTECH_CSEDS302T

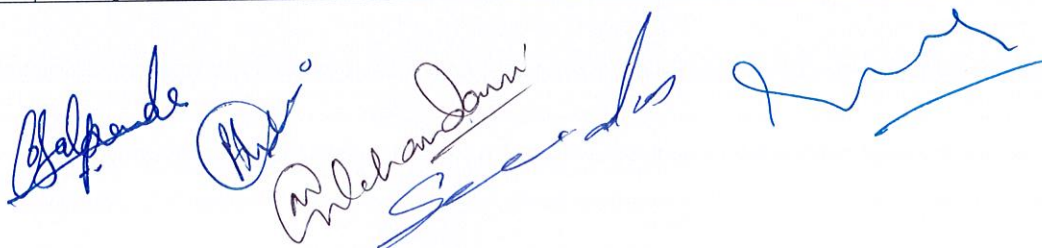| Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs (Theory)	4	-	4	30	70	100

Course Objective:

1	This course introduced features of object oriented programming.
2	The course provide carrier opportunities in implementation of various applications as object oriented concepts plays dominant role in software development.

Course Outcome:
At the end of this course students are able to:

CO1	Articulate the principles of object oriented programming using C++
CO2	Understand function overloading, constructor overloading, operator overloading, polymorphism & its uses in programming.
CO3	Implement inheritance concepts and its use for application development
CO4	Analyze of dynamic memory allocation and its use for software development
CO5	Implement concept of file handling in real life problems

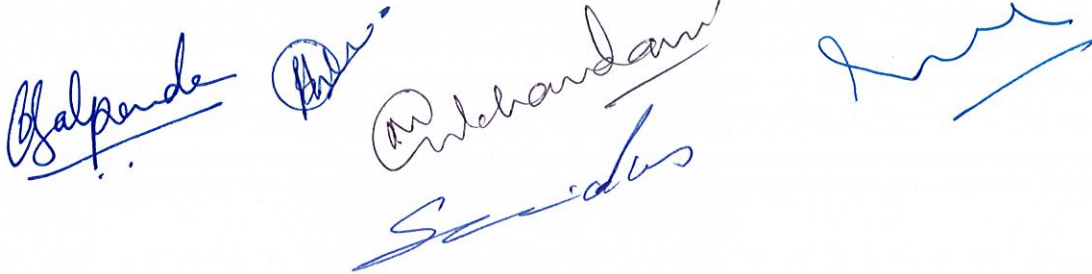| UNIT-I	**Principles of Object Oriented Programming -** Introduction to OOPS: Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Headers & Name Spaces
UNIT-II	**Functions & Polymorphism -** Functions, Types of Functions, Constructor, Destructor, Function overloading & Ambiguity, Operator Overloading, Function Overriding, Friend Function
UNIT-III	**Inheritance & Virtual Functions -** Inheritance and the access specifies, Types of Inheritance, Pointers and references to derived types, Virtual Functions
UNIT-IV	**Pointers & Dynamic allocations -** Static & Dynamic allocation using new and delete,* and ->* operators, Creating conversion functions, this pointer.
UNIT-V	**Event Driven Programming** Graphics programming – Frame – Components – working with 2D shapes – Using color, fonts, and images – Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – Introduction to Swing – layout management – Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons

Text Books:-

1.Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications

2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

Reference Books:

1. Let's C++ by Y. Kanetkar, BPB publications

2. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH

3. Object-Oriented Programming with C++, SouravSahay, Oxford University Press

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SEMESTER:THIRD(C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Object Oriented Programming Lab **Subject Code:** BTECH_CSEDS302P

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
2 Hrs (Practical)	1	25	25	50

Course Objective:

1	This course introduced features of object oriented programming.
2	The course provide carrier opportunities in implementation of various applications as object oriented concepts plays dominant role in software development.

Course Outcome:
At the end of this course students are able to:

CO1	Articulate the principles of object oriented programming using C++
CO2	Understand function overloading, constructor overloading, operator overloading, polymorphism & its uses in programming.
CO3	Implement inheritance concepts and its use for application development
CO4	Analyze of dynamic memory allocation and its use for software development
CO5	Implement concept of file handling in real life problems

List of Practical's:-

1	Write a C++ program to find both the largest and smallest number in a list of integers.
2	Write a Program to illustrate New and Delete Keywords for dynamic memory allocation
3	Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.
4	Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading.
5	Write a Program to Demonstrate Friend Function and Friend Class.
6	Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.
4	Program to illustrate default constructor, parameterized constructor and copy constructors
8	Write a Program to Invoking Derived Class Member Through Base Class Pointer
9	Write a Template Based Program to Sort the Given List of Elements.
10	Write a C++ program that uses function templates to find the largest and smallest number in a list of integers and to sort a list of numbers in ascending order.

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SEMESTER:THIRD(C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)
Subject Name: Computer Architecture and Digital System
Subject Code: BTECH_CSEDS-303T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs (Theory)	3	-	3	30	70	100

Course Objective:

1	To make students learn and apply basic theoretical concept of functional unit Processing unit, hardware and Micro programmed control unit, Arithmetic algorithms, Memory Mapping Techniques.
2	To make students learn and understand the concept and computer peripherals and types of Processors.

Course Outcome:
At the end of this course students are able to:

CO1	Identify the basic function ,units, various buses and addressing modes
CO2	Apply fundamental concept for executions and sequencing of control signals
CO3	Compare Hardwired and Micro Programmed control unit and write the control steps of microprogramming
CO4	Apply the knowledge of computer arithmetic algorithm and solve the problems
CO5	Design and implement various memory IC's, evaluation the main memory address.

UNIT-I	**Basic Structure of Computers:** Functional Units, Basic Operational Concepts, Bus Structures, Software, Multiprocessors and Multicomputers. **Machine Instructions**: Memory Locations and Addresses, Memory Operations, Machine program sequencing, addressing modes and encoding of information, Assembly Language ,Stacks, Queues and Subroutine.
UNIT-II	**Instruction Sets:** Instruction Format, limitations of Short word- length machines, High level language Considerations, Motorola 68000 architecture. **Processing Unit:** Some fundamental concepts, Execution of a complete instruction, Single, two, three bus organization, Sequencing of control Signals.
UNIT-III	**Micro-programmed Control:** Microinstructions, grouping of control signals, Micro program sequencing, Micro Instructions with next Address field, Perfecting microinstruction, Emulation, Bit Slices, Introduction to Microprogramming, Macro Processor.

UNIT-IV	**Arithmetic**: Number Representation, Addition of Positive numbers, Logic Design for fast adders, Addition and Subtraction, Arithmetic and Branching conditions, Multiplications of positive numbers, Signed Operand multiplication, fast Multiplication, Booth"s Algorithm, Integer Division, Floating point numbers and operations.
UNIT-V	**The Memory System:** Some Basic Concepts, Semiconductor RAM Memories, Memory system considerations,Semiconductor ROM Memories, Memory interleaving, Cache Memory, Mapping techniques, Virtual memory, Memory Management requirements.Introduction to RISC & CISC Processors, Introduction to Pipelining.

Text Books:-

1.Computer Organization 4 th Edition, 2001 V. Carl HamacherMcGrawHill.

2. Computer Organization and Design (The Hardware/Software Interfaces) 4thEdition David A. Patterson & John L. Hennessy Morgan Kaufmann.

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SEMESTER:THIRD(C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)
Subject Name: Operating System
Subject Code: BTECH_CSEDS-304T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs (Theory)	3	1	4	30	70	100

Course Objective:

1	Introducesgeneralidea,structureandfunctionsofoperatingsystem
2	Making students aware of basic mechanisms used to handle processes,memory,storagedevicesandfiles.

Course Outcome:

At the end of this course students are able to:

CO1	Identify basic structure and purposeof operatingsystem.
CO2	Interpret the concepts of process and illustrate various CPU schedulingalgorithms.
CO3	Interpretthe conceptsofinterprocesscommunication.
CO4	Schematize Deadlock& securitymechanismsinoperatingsystems.
CO5	Analyze different memory management techniques with advantages anddisadvantages.

UNIT-I	EvolutionofOS,TypesofOS,Basich/wsupportnecessaryformodern operatingsystems,servicesprovidedbyOS,systemprogramsandsystemcalls,systemdesignandimplementation.
UNIT-II	Process&ItsSchedulingProcessconcept,processcontrolblock,Typesofscheduler,contextswitch, threads, multithreading model, goals of scheduling and differentscheduling algorithms,
UNIT-III	Processmanagementandsynchronization:Concurrencyconditions,Critical section problem, software and hardware solution, semaphores,conditionalcriticalregionsandmonitors,classicalinterprocesscommunicationproblems
UNIT-IV	Deadlockdefinitions,Prevention,Avoidance,detectionandRecovery, GoalsofProtection,accessmatrix,Deadlockimplementation
UNIT-V	File systems: File concept, Access methods space allocation strategies,diskarmschedulingstrategies.Contiguousallocation,Relocation,Paging,Segmentation,Segmentationwithpaging,demandpaging,Virtual MemoryConcepts,pagefaultsandinstructionrestart,pagereplacement algorithms, working sets, Locality of reference, Thrashing,GarbageCollection.

Text Books:-

1.OperatingSystemconcepts–Silberchatz;Galvin,AddisonWesley,6th Edition.

2.ModernOperatingSystems–Tanenbaum,PearsonEdn.2nd Edition

3.OperatingSystems:InternalsandDesignPrinciples--William Stallings

Reference Books:

1.OperatingSystems–SRSathe,MacmillanPublishers,India,2008

2.OperatingSystems- 3 rd EditionbyGaryNutt,PearsonEducation.

Subject Name: Operating System Lab   **Subject Code:** BTECH_CSEDS-304P

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
2 Hrs (Practical)	1	25	25	50

Course Objective:

1	This course introduced features of object oriented programming.
2	The course provide carrier opportunities in implementation of various applications as object oriented concepts plays dominant role in software development.

Course Outcome:

At the end of this course students are able to:

CO1	Ability to implement inter process communication between two processes.
CO2	Ability to design and solve synchronization problems.
CO3	Ability to simulate and implement operating system concepts such as scheduling, Deadlock management, file management, and memory management.

List of Practical's:-

1	Write a c program to simulate the CPU scheduling algorithm First Come First Serve (FCFS)
2	Write a program to stimulate the CPU scheduling algorithm Shortest job first (Non- Preemption)
3	To simulate the CPU scheduling algorithm round-robin.
4	To implement and simulate the MFT algorithm
5	To write a program to simulate the MVTalgorithm
6	Write a C program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit
4	To implement FIFO page replacement technique.
8	Program to simulate Single level directory file organization technique.
9	Program to simulate two level file organization technique
10	To implement deadlock prevention technique

Subject Name: Ethics in IT   **Subject Code:** BTECH_CSEDS-305T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs (Theory)	3	-	3	30	70	100

Course Objective:

1	Examining the worms and viruses which influence internet use and security.
2	To be familiar with the basic ideas of privacy in different foreign jurisdictions of cyber laws
3	To get basic understanding of the laws governing confidential information, copyright, patents, designs, trademarks, and unfair competition.

Course Outcome:
At the end of this course students are able to:

CO1	Understand the overview of ethical and professional behavior
CO2	Able to understand the concepts of computer and internet crime
CO3	Understand the various privacy techniques
CO4	Able to understand the concepts of intellectual property and issues in software development
CO5	Understand the concept of ethics of IT organization and impact of Information Technology on the quality of life

UNIT-I	An overview of Ethics: Ethics in business world, Ethics in IT, Ethics for IT professionals and IT users, IT professionals, Ethical behavior, IT professional malpractices, IT users.
UNIT-II	Computer and Internet Crime: IT security incidents: Increasing Complexity Increases Vulnerability, Higher Computer user Expectations, Expanding and changing systems. Introduces new risks, Increased Reliance on Commercial Software with known Vulnerabilities, Types of Exploits, Perpetrators, Reducing Vulnerabilities, Risk Assessment, Establishing a Security Policy, Educating Employees, contractors and parttime Workers, Prevention, Detection, Response.
UNIT-III	Privacy: The right of Privacy, Recent History of Privacy Protection, Key Privacy andAnonymity issues, Governmental Electronic Surveillance, Data Encryption, Identity Theft, Consumer Profiling, Treating Consumer Data Responsibility, Workplace Monitoring, Advanced surveillance Technology, Defamation, Freedom of Expression: Key issues, Controlling Access to Information on the Internet, Anonymity, National, Security Letters, Defamation and Hate Speech.
UNIT-IV	Intellectual Property: Copyrights, Patents, Trade Secret Laws, Key Intellectual

	Property Issues, Plagiarism, Reverse Engineering, Open Source Code, Competitive Intelligence, Cyber squatting, Software Development, Strategies to Engineer Quality Software, The Importance of Software Quality, Software Development Process, Capability Maturity Model Integration for Software, Key Issues in Software Development, Development of Safety-Critical Systems, Quality Management Standards.
UNIT-V	Ethics of IT Organization: Need for Nontraditional Workers, Contingent Workers H-IB Workers, Whistle-blowing, Protection for Whistle-Blowers, Dealing with Whistle-Blowing Situation.The Impact of Information Technology on the Quality of Life

Text Books:-

1. G.K. Awari & Sarvesh V. Warjurkar "Ethics In Information Technology" (A Practical Guide), Cognitive Approach in Cloud & Edge Computing **CRC Press (Taylor & Fransis Group)**

2.George W. Renolds Ethics in IT

Reference Books:

1.Deborah G.Johnson,"Computer Ethics",3/e Pearson Education.

2. Sara Baase, "A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet," PHI Publications.

3. Richard A.Spinello, "Case study in Information Technology Ethics", second Edition PHI Publications.

4. Duncan Lanford "Internet Ethics".

5. D. Micah Hester and Paul J. Ford "Computer and Ethics in the Cyber age".

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SEMESTER:THIRD(C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Universal Human Values   **Subject Code:** BTECH_CSEDS-306T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
3Hrs (Theory)	2	-	2	15	35	50

Course Objective:

1	Development of a holistic perspective based on self-exploration, about themselves, family, society and nature.
2	Understanding of the harmony in the human being, family, society and existence.
3	Strengthen of self-reflection

Course Outcome:
At the end of this course students are able to:

CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the role of a human being in ensuring harmony in society and nature.
CO4	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
CO5	Handle better critical ability

UNIT-I	Value Education, Definition, Concept and Need for Value Education. The Content and Process of Value Education. Basic Guidelines for Value Education. Self-exploration as a means of Value Education. Happiness and Prosperity as parts of Value Education.
UNIT-II	Human Being is more than just the Body. Harmony of the Self ('I') with the Body. Understanding Myself as Co-existence of the Self and the Body. Understanding Needs of the Self and the needs of the Body. Understanding the activities in the Self and the activities in the Body.
UNIT-III	Family as a basic unit of Human Interaction and Values in Relationships. The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude and Love. Comprehensive Human Goal: The Five Dimensions of Human Endeavour. Harmony in Nature: The Four Orders in Nature. The Holistic Perception of Harmony in Existence.
UNIT-IV	The Basics for Ethical Human Conduct. Defects in Ethical Human Conduct. Holistic Alternative and Universal Order. Universal Human Order and Ethical Conduct. Human Rights violation and Social Disparities

UNIT-V	Value based Life and Profession. Professional Ethics and Right Understanding. Competence in Professional Ethics. Issues in Professional Ethics – The Current Scenario. Vision for Holistic Technologies, Production System and Management Models.

Text Books:-1. A.N Tripathy, New Age International Publishers, 2003.
2.Bajpai. B. L , New Royal Book Co, Lucknow, Reprinted, 2004
3.Bertrand Russell Human Society in Ethics & Politics

Reference Books:
1.Corliss Lamont, Philosophy of Humanism
2.Gaur. R.R. ,Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3.Gaur. R.R. ,Sangal. R ,Bagaria. G.P, Teachers Manual Excel Books, 2009.
4.I.C. Sharma . Ethical Philosophy of India Nagin& co Julundhar
5.Mortimer. J. Adler, – Whatman has made of man
6.William Lilly Introduction to Ethic Allied Publisher

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SEMESTER:THIRD(C.B.C.S.)
BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Computer Workshop-I Lab   **Subject Code:** BTECH_CSEDS-307P

Load	Credits	College Assessment Marks	University Evaluation	Total Marks
2 Hrs (Practical)	1	25	25	50

Course Objective:

1	Understand the basic computer hardware and system requirements. •
2	Familiar with the use of websites and access search engines to find information and troubleshoot basic computer problems
3	Realize the importance of basic technologies related to an office environment, PHP.

Course Outcome:
At the end of this course students are able to:

CO1	Analyze the working principles of computer peripherals
CO2	Identify, Analyze and Apply the troubleshooting techniques to solve operating system and hardware problems.
CO3	Create/ manipulate the documents, spreadsheets and presentations using MS office and Webpages using HTML for real-time applications
CO4	Implement the concept of file handling
CO5	Understand PHP script & its uses in programming.

List of Practical's:-

1	Study of peripherals of a computer, components in a CPU and its functions.
2	Assembling and disassembling of PC
3	Installation of Operating Systems – Windows
4	Installation of Operating Systems –LINUX
5	Hardware Troubleshooting
6	Software Troubleshooting
4	Configuring Firewalls and installation of Antivirus software
8	C Program to merge two files
9	Write PHP scripts to handle HTML forms
10	C program to delete a specific line from a text file and find the numbers of lines a text file.

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BRANCH: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Subject Name: Environment Science (Audit Course)   **Subject Code:** BTECH_CSEDS-308T

Load	Lecture	Tutorial	Credits	College Assessment Marks	University Evaluation	Total Marks
2Hrs (Theory)	2	-	Nil	Nil	Nil	Nil

UNIT-I	**Air Pollution:** Contaminant behavior in the environment ,Air Pollution , Indoor air Pollution, Technique to control Air Pollution, ambient air quality and continuous air quality monitoring
UNIT-II	**Water Pollution:** Major source of water pollution, Acid mine, fertilizers, dyeing and tanning, marine pollution , micro plastics,Eutrophication ,drains Technique to control water pollution: Conventional waste water treatment-types of sewage, sewerage system, alternative system, primary, secondary and tertiary process including aerobic and anaerobic techniques
UNIT-III	**Waste Management and other environment pollution:**Soil pollution : soil around us , soil water characteristics , soil pollution ,causesSolid waste Management: Composting , Vermiculture , landfills, hazardous waste treatment, bioremediation technologies, conventional technique .
UNIT-IV	Social Issue and Environmental Laws: Concept of sustainable development water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people: Its problem and concern.Environment laws, Environment protection Act, Air (prevention and control of pollution), wildlife protection Act, forest conservation act, Issue involved in enforcement of environment legislation.

Reference Books:

1. B.K. Sharma, Environment Chemistry, Goel Publication House, Meerut.
2. Benny Joseph, Environmental Studies, Mc, Graw Hill Education Private Limited.
3. Shree Nathsingh , Microbial Degradation of Xenobiotics, Springer-verlag Berlin heidelberg