IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.)

[Computer Science & Engineering (AIML)]

III Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work / Lab Work & Sessional		L	T	P	
1.	BSC-CSCL301	BSC	Numerical Methods, Statistics, Fourier & Fuzzy theory	70	20	10	–	–	100	3	1	–	4
2.	ESC-CSCL301	ESC	Digital System	70	20	10	60	40	200	2	1	2	4
3.	PCC-CSCL301	PCC	Data Structure & Algorithm	70	20	10	60	40	200	2	1	2	4
4.	PCC-CSCL302	PCC	Artificial Intelligence	70	20	10	60	40	200	2	1	2	4
5.	PCC-CSCL303	PCC	Programming Practices(C++)	–	–	–	60	40	100	–	–	6	3
6.	HSMC-CSCL301	HSMC	Principles of Mgt & Managerial Economics	70	20	10	–	–	100	3	–	–	3
7.	MC-3	MC	Energy, Environment, Ecology	–	–	–	–	–	–	2	–	–	0
			Total	350	100	50	240	160	900	14	4	12	22

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

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III Semester

BSC-CSCL301	**Numerical Methods, Statistics, Fourier & Fuzzytheory**	**3L:1T:0P (4 Hrs)**	**4 Credits**

Course Objective: Mathematics is the basic necessity for the foundation of engineering and technology. The main objective of this course is to teach mathematical method, develop mathematical skills and increase students' thinking power.

Course Content: (46 hrs.)

Module- 1: **Numerical Methods (10 Hours)**

Solution of algebraic and transcendental equations – Newton-Raphson method and Regula-Falsi method, Finite differences, Interpolation using Newton's forward and backward difference formulae, Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae, Inverse interpolation by Lagrange's method.

Module- 2: Statistics (8 Hours)

Mean, Median, Mode, Standard deviation, Variance, Correlation, Regression, Curve fitting: Fitting of straight line, Fitting of second degree parabola.

Module-3 : Probability (9 Hours)

Introduction to probability, Conditional probability, Baye's theorem, Probability mass function, Probability density function, Probability distribution: Binomial distribution, Poisson distribution, Normal distribution.

Module-4: Fourier Transformations (9 Hours)

Fourier transform: Definition and properties, Convolution of Fourier transformation, Fourier transformation on function spaces, Solution of ordinary and partial differential equation by Fourier transformation.

Module-5: Fuzzy Set Theory (10 Hours)

Definition of a fuzzy set, Classical sets vs. Fuzzy sets, Types of fuzzy sets, Operations on fuzzy sets, Fuzzy relations, Relations including operations: Reflexivity, Symmetry and Transitivity, Pattern classification based on fuzzy relations, Fuzzy analysis including metric spaces, Distances between fuzzy sets, Area, Perimeter, Height, Width of fuzzy subsets, Applications.

Course Outcomes:

CO1: To explain and apply the numerical methods in engineering problems.

CO2: To explain the basic concepts of statistics and apply in engineering fields.

CO3: To explain and apply the concepts of probability distribution in evaluation of engineering problems.

CO4: To define Fourier Transform and apply in different engineering problems.

CO5: To describe and apply the concepts of fuzzy sets.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2018.
2. B. V. Ramanna, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 2017.
3. Chandrika Prasad & Reena Garg, Advanced Engineering Mathematics, Khanna BookPublishing Co. (P) Ltd., Delhi, 2018.
4. Sudhir K. Kumar and Rimple Pundir, Fuzzy sets and their Applications, Pragati Prakashan, 9th Edition, 2018.
5. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
6. R. W. Hamming, Numerical Methods for Scientist and Engineers, Dover Publications,2nd Edition , New York.
7. T. Veerarajan, Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2017.
8. D. C. Montgomery and G. C. Runjer, Applied Statistics & Probability for Engineers,Wiley Publication, 6th Edition.
9. T.T. Soong, Fundamental of Probability & Statistics for Engineers, John Wiley & SonsLtd, 2004.
10. M. Ganesh, Introduction to Fuzzy Sets and Fuzzy Logic, PHI Learning, 2009.

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III Semester

ESC-CSCL301	Digital Systems	2: 1: 2 (40 Hrs.)	4

Recommended Prerequisite: - Engineering Physics, Electronic Devices

Course Objective: The course is designed to acquire the basic knowledge of digital logic levels and application of digital electronics circuits and different types of memories. To impart how to design Digital Circuits. To understand the basic software tools for the design and implementation of digital circuits and systems.

Course Content: (40 hrs.)

Module 1 **(8 Hrs.)**

Review of Number Systems, Codes-BCD, Excess- 3, Gray Reflected ASCII,EBCDIC, review of Logic gates and binary operations, Implementations of Logic Functions using gates, NAND–NOR implementations. Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality, Boolean function, Canonical and standard forms,Minimization of Boolean functions, Sum of Products (SOP), Product of Sums (POS),Karnaugh map Minimization, Quine-McCluskey method of minimization.

Module 2 **(8 Hrs.)**

Combinational logic circuits: Adder, subtractor, Carry Look Ahead adder, BCD adder, Binary Multiplier, Multiplexer/De-multiplexer, decoder/encoder, code-converters, designing of combinational Circuits, Introduction to Races and Hazards.

Module 3 **(8 Hrs.)**

Sequential logic: flip flops, D, T, S-R, J-K, race around condition and its remedies, Edge & Level triggered circuits, Shift registers, Asynchronous and synchronous counters, their types and state diagrams.

Module 4 **(8 Hrs.)**

Logic Families and its Specifications: RTL, DTL, TTL, ECL, CMOS, Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices, PLDs, Semiconductor memories and classification of ROM, RAM and storage devices.

Module 5 **(8 Hrs.)**

Digital-to-analog conversion (DAC) - R-2R ladder Type, Weighted converter using Op-amp and transistor. Analog-to-digital Conversion (ADC) -Counter type, Successive Approximations Register, Flash type, Digital hardware description methodology, HDL, different modeling in VHDL, VHDL construct and codes for combinational circuit.

Assessment: Mid Term tests, Assignments, Tutorial, Quiz and End semester exams.

Course Outcomes:-

Students earned credits will develop ability to

1. Illustrate basic postulates of Boolean algebra. To design Boolean functions by applyingthe methods for simplifying Boolean expressions.
2. Illustrate fundamental concepts and design of digital combinational circuits.
3. Illustrate the basic methods for the design of sequential circuits.
4. Illustrate the operation of Logic families and Analyze and design of programmable logic devices.
5. Design and simulate the Logic circuits using HDL and appropriate EDA tool.

DIGITAL SYSTEM DESIGN LAB

1. Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates.
2. Design and Implement Half Adder and Half subtractor.
3. Design and Implement Multiplexer, De-multiplexer.
4. Design and Implement BCD to Gray Code Converters.
5. Design and Implement Encoder, Decoder.
6. Verify the truth table of RS, JK, T and D flip-flops using NAND & NOR gates
7. Design and Implement a modulo-4 asynchronous counter.
8. Analysis of Analog to Digital Converter.
9. Design and simulate half adder and full adder using xilinx tool (VHDL)
10. Design and simulate Multiplexer using xilinx tool (VHDL)
11. Design and simulate D flip flop using xilinx tool (VHDL)
12. Design and simulate ALU using xilinx tool (VHDL)

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Text Books/ Reference Books

1. R. P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.
2. W. H. Gothmann, “Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition, 2006.
3. D. V. Hall, “Digital Circuit and System”, Tata McGraw Hill, 1989.
4. S. Salivahanan & S. Arivazhagan, “Digital Circuits and Design”, VikasPublishing.
5. M. Morris Mano, “Digital Logic and Computer Design”, Pearson India Education, 1st edition, 2012
6. Douglas Perry, “VHDL Programming by example”, McGraw Hill, 1st edition, 2002.
7. J. Bhaskar, “VHDL: Primer”, P T R Prentice Hall, 3rd edition, 1999.

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III Semester

PCC-CSCL301	**Data Structure & Algorithm**	**2L : 1T : 2P (5 hrs.)**	**4 credits**

Prerequisite: Basic Programming Knowledge and Programming for Problem Solving.

Course Objective:

The objective of this course is to understand different types of data structures and algorithms used in program.

Course Content: (46 hrs.)

Module 1: **(10 hrs.)**

Review of C programming language. Introduction to Data Structure: Concepts of Data and Information, Classification of Data structures, Abstract Data Types, Implementation aspects: Memory representation. Analysis of algorithm: Time Complexity and Space Complexity, Data structures operations and its cost estimation, Basic of Asymptotic notation. Introduction to linear data structures- Arrays, String, representation & Operations, Linked List: Representation of linked list in memory, different implementation of linked list. Circular linked list, doubly linked list, etc. Application of linked list: polynomial manipulation using linked list, etc.

Module 2: **(10 hrs.)**

Stacks: Stacks as ADT, Different implementation of stack, multiple stacks. Application of Stack: Conversion of infix to postfix notation using stack, evaluation of postfix expression, Recursion. Queues: Queues as ADT, Different implementation of queue, Circular queue, Concept of Dqueue and Priority Queue, Queue simulation, Application of queues.

Module 3: **(10 hrs.)**

Tree: Definitions - Height, depth, order, degree etc. Binary Search Tree - Operations, Traversal, Search, AVL Tree, Heap, Applications and comparison of various types of tree; Introduction toforest, multi-way Tree, B tree, B+ tree, B* tree and red-black tree.

Module 4: **(08 hrs.)**

Graphs: Introduction, Classification of graph: Directed and Undirected graphs, etc, Representation, Graph Traversal: Depth First Search (DFS), Breadth First Search (BFS), Graph algorithm: Minimum Spanning Tree (MST)- Kruskal, Prim's algorithms. Dijkstra's shortest path algorithm; Comparison between different graph algorithms. Application of graphs.

Module 5: **(08 hrs.)**

Sorting: Introduction, Classification of sorting method, Sort methods like: Bubble Sort, Quick sort. Selection sort, Heap sort, Insertion sort, Shell sort, Merge sort and Radix sort; comparison of various sorting techniques. Searching: Basic Search Techniques: Sequential search, Binary search, Comparison of search methods. Case Study: Application of various data structures in operating system, DBMS etc.

Course Outcome:

1. Understand basic data structures such as arrays, linked lists, stacks and queues
2. Introduce the concept of data structures through ADT including List, Stack, Queues.
3. Understand the basic operations of trees and its types.
4. Understand the basic concept of graph and its operations.
5. Demonstrate and implement searching sorting algorithms.

List of Text / Reference Books:

1. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures" ComputerScience Press.
2. Mark Allen Weiss "Algorithms, Data Structures, and Problem Solving with C++" , Pearson Education (US) 1996
3. R. G. Dromey "How to Solve it by Computer", 2nd Impression by, PHI
4. AM Tanenbaum, Y Langsam& MJ Augustein, "Data structure using C and C++", 2nd Ed., 2006 , Prentice Hall India.
5. Robert Kruse, Bruse Leung, "Data structures & Program Design in C", 2nd Ed.,1997, Pearson Education.
6. Aho, Hopcroft, Ullman, "Data Structures and Algorithms", Pearson Education.
7. Richard, GilbergBehrouz, Forouzan ,"Data structure – A Pseudocode Approach with C", 2nd Ed., Thomson press.

List of Experiments:

Write a program:

1. To perform insertion and deletion operations on array.
2. To perform multiplication operation on matrix
3. To calculate factorial of number using recursion.
4. To demonstrate static implementation of stack.
5. To demonstrate dynamic implementation of stack.
6. To demonstrate static implementation of Linear queue.
7. To demonstrate dynamic implementation of Linear queue.
8. To implement circular queue.
9. To implement single linked list.
10. To implement doubly linked list.
11. To implement binary search tree.
12. To perform BFS and DFS operations on graph.
13. To perform binary search operation.
14. To perform sorting operation using bubble sort.
15. To perform sorting operation using insertion sort.

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III Semester

PCC-CSCL302	**Artificial Intelligence**	**2L : 1T : 2P (5 hrs.)**	**4 credits**

Recommended Prerequisite: Preliminary knowledge of Elementary Statistics

Course Objective:

The course is designed to demonstrate fundamental understanding of artificial intelligence (AI) and its basic principles. Course will cover foundational concepts of AI that require problem solving, inference, perception, knowledge representation, and learning. Students will be able understand the application of Artificial Intelligence techniques for problem solving.

Course Content: (43 hrs.)

Module 1: **(08 hrs.)**

Introduction: Meaning and definition of artificial intelligence, Physical Symbol Sys-tem Hypothesis, production systems, Characteristics of production systems; Breadth first search and depth first search techniques. Heuristic search Techniques: Hill Climbing, Iterative deepening DFS, bidirectional search. Analysis of search methods. A* algorithm, and their analysis.

Module 2: **(08 hrs.)**

Introduction to Genetic Algorithms: Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, logical consequences, syntax and semantics of an expression, semantic Tableau. Forward and backward reasoning. Proof methods, substitution and unification, conversion to clausal form, normal forms, resolution, refutation, deduction, theorem proving, inferencing, monotonic and non monotonic reasoning.

Module 3: **(9 hrs.)**

Introduction to prolog: Network-based representation and reasoning, Semantic networks, Conceptual Graphs, frames. Description logic (DL), concept language, reasoning using DL. Conceptual dependencies (CD), scripts, reasoning using CD.

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Module 4: **(08 hrs.)**

Introduction to natural language processing: Adversarial search and Game theory, classification of games, game playing strategies, prisoner's Dilemma. Game playing techniques, minimax procedure, alpha-beta cut-offs. Complexity of alpha-beta search. Automated planning, classical planning problem, forward planning, partial order planning, planning with proposal logic, hierarchical task planning, multiagent planning.

Module 5: **(10hrs.)**

Reasoning in uncertain environments, Fuzzy logic, fuzzy composition relation, operations on fuzzy sets. Probabilistic reasoning, Bayes theorem, construction of Bayesian networks, belief propagation. Markov processes and Hidden Markov models.

Course Outcome:

1. State the core concepts of Artificial Intelligence, It's foundation and principles.
2. Examine the useful search techniques; learn their advantages, disadvantages and be able to develop intelligent systems.
3. Learn the practical applicability of intelligent systems, specifically its applications.
4. Understand AI in different areas like NLP, Pattern Recognition, game planning etc.
5. Understand important concepts like Expert Systems, AI applications.

List of Text / Reference Books:

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-GrawHill.
2. Introduction to AI & Expert System: Dan W.Patterson, PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Pearson Education

List of Experiments:

1. Installation of gnu-prolog, Study of Prolog (gnu-prolog), its facts, and rules.
2. Write simple facts for the statements and querying it.
3. Write a program for Family-tree.
4. Write Program for Monkey-banana Problem.
5. Write a program which behaves a small expert for medical Diagnosis.
6. Write programs for computation of recursive functions like factorial Fibonacci numbers, etc.
7. Write program to solve 5-queens problem.
8. Write a Program for water jug problem.
9. Write a program for travelling salesman program.
10. Case study of standard AI programs like Mycin and AI Shell

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PCC-CSCL303	**Programming Practices (C++)**	**0L : 0T : 6P (6 hrs.)**	**3 credits**

Prerequisite: C Programming Language

Course Objective:

Interpret good knowledge in C++ programming language and enable them to build Programs.

Course Content: (42 hrs.)

Module 1: **(10hrs.)**

Introduction of C++, Programming paradigms, Language translator, Structure of C++ program. Declaration, Expression and statements: Data types, Variables, Constants, Operator and expression, Operator precedence and associativity & Control statements.

Module 2: **(08 hrs.)**

Array: Declaration & Initialization, 2-D Array & Multidimensional Array. Function: Declaration, Definition and call, Inline function, Main function argument, Reference variable, Function overloading, Default argument, Parameter passing, Recursion, Scope of variable, Return-by-value and Return-by-reference.

Module 3: **(08hrs.)**

Class: Class, Members, Constructor and destructor, Copy constructor, parameterized constructor, Static member, Scope of class names. Dynamic memory management: Operators new and delete.

Module 4: **(08 hrs.)**

Introduction, Polymorphism, Overloading, Parametric and inclusion polymorphism Inheritance: inheritance and Types of inheritance, Virtual base class, Virtual function, Abstract class, Overriding and hiding, Dynamic binding of functions.

Module 5: **(08 hrs.)**

Class template, Member function inclusion, Function template, Specialization, Inheritance, Namespace. Concept of exception handling, Catch block, Nested try-catch block, Condition expression in throw expression, Constructor & destructor, Runtime standard exception. Standard library function, Input and output, Iostream class hierarchy, Class ios, Other stream classes, Basics of file handling.

Course Outcome:

1. Understand expression and statements and apply them in solving Problems.
2. Explain and be able to use array and function in writing programs.
3. Explain and be able to use class in writing programs.
4. Explain and be able to use Polymorphism and Inheritance in writing programs.
5. Explain and be able to use template and exception handling in writing programs.

List of Text / Reference Books:

1. B. Stroutstrup "The C++ Programming Language", 3rd Edition, 2002, PearsonEducation.
2. Josée Lajoie and Stanley B. Lippman "C++ Primer", 3rd Edition**,** Addison Wesley
3. E.Balagurusamy "Object Oriented Programming with C++ ", 7e, TMH
4. Rajesh K.Shukla "Object Oriented Programming in C++", Wiley India

List of Experiments:

1. To display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of classobjects. Read and display the contents of the array.
2. To declare Struct. Initialize and display contents of member variables.
3. To declare a class. Declare pointer to class. Initialize and display the contents of the classmember.
4. Given that an EMPLOYEE class contains following members: data members: Employeenumber, Employee name, Basic, DA, IT, Net Salary and print data members.
5. To read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).
6. To illustrate the concepts of console I/O operations.
7. To use scope resolution operator. Display the various values of the same
8. To allocate memory using new operator.
9. To create multilevel inheritance. (Hint: Classes A1, A2, A3)
10. To create an array of pointers. Invoke functions using array objects.
11. To use pointer for both base and derived classes and call the member function. Use Virtualkeyword.
12. To implement a file handling program for demonstration of database connectivity.
13. To make a small project using C++.

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III Semester

HSMC-CSCL301	**Principles of Management and Managerial Economics**	**3L: 0T: 0P (3 hrs.)**	**3 Credits**

Pre requisite(s): Nil

Course Objectives:

- Explain management, organization and the roles of managers & Explain different theories of management.
- Describe the importance of planning and organization Structure.
- Discuss the control process and its elements
- Explain the term Managerial Economics & its importance.
- Explain productivity & factors that affect productivity.

Course Content:

Module-1 **(08 hrs)**

Introduction: Definition, Functions, Process, Scope and Significance of Management. Nature of Management, Managerial Roles, Managerial Skills and Activities, Difference between Management and Administration. Significance of Values and Ethics in Management.

Evolution of Management: Thought Approaches of Management Thought, Functions of Management. Different theories of Management.

Module-2 **(08 hrs)**

Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

Module-3 **(08 hrs)**

Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation, Concept ofLeadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

Module-4 **(08 hrs)**

Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of theCost, Theory of the Firm, Theory of Production Function.

Module-5 **(10 hrs)**

Productivity:

Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.

Course Outcomes:

After completion of the course student will be able to:

- Understanding of basic concepts, principles and practices of management
- Understanding the planning and organizing & organization Structures.
- Importance of Management Control Techniques
- Understand the term Managerial Economics & its importance.
- Understand productivity & factors that affect productivity.

Text Books :

1. Chhabra T.N., Principles and Practice of Management. 10th ed Year 2018.
2. Murton- Gulab, Management Today. 3th ed.1998
3. KoontzH. and O"DonnelH., Essential of Management, 8th ed., McGraw-Hill, New Delhi, 2009.
4. Robbins, S.Fundamentals of Management. 5th ed., Pearson Education,
5. Canada, 2008.

Reference Book:

6. Prasad L M, Principles and Practices of Management, S. Chand and Sons, New Delhi ,2018
7. Terry & Francklin, Principles of Management, Richard– Erwin.18th Ed. 1982

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III Semester

MC-3	**III**	**Energy & Environmental Engineering**	**L-2, T-0, P-0**	**0 Credits**

Course Objective-To provide an introduction to energy resources and an emphasis on alternative energy sources and their application. To study the interrelationship between the living organism and environment. To understand the transformation and degradation of organic pollutants in the environment

Course Content-

Module 1: **6 hrs**

Energy: Introduction, conventional and non-conventional energy resources - coal, oil, gas, solar energy, wind energy, geothermal energy, hydropower, bio-energy, nuclear energy. Energy survey in India. Current and future energy requirements in India and across the world including associated environmental problems.

Module 2: **8 hrs**

Ecosystem and biodiversity: introduction of an ecosystem, forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems (ponds, rivers, oceans),biodiversity at global, national and local levels. Threats to biodiversity, value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; endangered and endemic species of india. Conservation of biodiversity: in-situ and ex-situ.

Module 3: **8 hrs**

Air pollution and water pollution: definition, cause, effects and control measures of air pollution; mobile and stationary sources of air pollutants, effective stack height concept, co, co_2, h_2s, so_x, no_x emissions, and its control. Definition, classification, cause, effects and control measures of water pollution, measurement of levels of pollution such as do, bod, cod.

Module 4: **6 hrs**

E-waste: Definition, classification, cause, effects and control measures of e-waste, global trade issues of e-waste, recycling method of e-waste & its benefit.

Module 5: **8 hrs**

Environment impact & protection act environment: protection act; air (prevention and control of pollution) act; water (prevention and control of pollution) act; wildlife protection act; forest conservation act; issues involved in enforcement of environmental legislation; public awareness. Environmental impact assessment. Measuring environmental impacts and policies for the regulation of environmental impacts.

Course outcome-

CO 1: Ability to understand basic concepts conventional and non-conventional energy resources.

CO2: Ability to understand Ecosystem& Biodiversity.

CO3: To provide knowledge about Air pollution & Water Pollution.

CO4: To provide knowledge & reuse of E-Waste.

CO5: Ability to understand basic concepts of Environment Impact & Protection Act.

Text/Reference Book-

1. Environmental Engineering - H.S. Peavy & D.R. Rowe-Mc Graw Hill Book Company, New Delhi
2. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, EnvironmentalEncyclopedia, Jaico Publ. House, Mumbai,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)