Course structure

Semester III

Theory/ Practical	Sl. No	Course Type	Course Code	Course Name	Hours per week			Credit	Mark	
					L	T	P	C	CA	FA
Theory										
T	1.	PCC	**BEC23101T**	Electronic Devices	2	1	0	3	40	60
T	2.	PCC	**BEC23102T**	Digital System Design	2	1	0	3	40	60
T	3.	PCC	**BEC23103T**	Signals and Systems	2	1	0	3	40	60
T	4.	PCC	**BEC23104T**	Network Theory	2	1	0	3	40	60
T	5.	PCC	**BEC23105T**	Data structure	2	1	0	3	40	60
T	6	BSC	**BMA23213T**	Probability Theory and Stochastic Processes	2	1	0	3	40	60
T	7	AU	**BCH23112T**	Environmental Science	2	0	0	0	0	100
Laboratories										
P	1	PCC	**BEC23101P**	Electronic Devices Lab	0	0	2	1	50	50
P	2	PCC	**BEC23102P**	Digital System Design Lab	0	0	2	1	50	50
P	3	PCC	**BEC23103P**	Signals and Systems Lab	0	0	2	1	50	50
p	4	PCC	**BEC23104P**	Network Theory Lab	0	0	2	1	50	50
				Total	**14**	**6**	**8**	**22**	**440**	**660**

BEC23101T	**ELECTRONIC DEVICES**	**3L:0T:0P**	**3 Credits**

Pre-requisites: Physics

Course outcomes:

At the end of this course students will demonstrate the ability to

CO1: Understand the principles of semiconductor Physics and apply it to electronic devices
CO2: Appreciate different devices for different applications.
CO3: Understand and utilize the mathematical models of semiconductor devices for circuits.
CO4: Understand the basic processes required for fabrication of electronic devices.

Course Contents:

MODULE	**CONTENT**	***No. of class***
MODULE 1	Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon. Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors, Generation and recombination of carriers; Poisson and **continuity equation.**	**16**
MODULE 2	P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode, LED, photodiode, and solar cell.	**10**
MODULE 3	Bipolar Junction Transistor, I-V characteristics, Ebers Moll Model, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor.	**10**
MODULE 4	Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.	**8**

Text /Reference Books

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson,2014.
2. D. Neamen, D. Biswas, "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BEC23102T	DIGITAL SYSTEM DESIGN	3L:0T:0P	3 Credits

Pre-requisites: Number system

Course outcomes:
At the end of this course students will demonstrate the ability to
CO1: : Understand the basic logic operations and combinational logic elements.
CO2: : Design of combinational circuits
CO3: : Design of synchronous sequential logic circuits.
CO4: : Use HDL and appropriate EDA tool for digital logic design and simulation.

Course Contents:

MODULE	CONTENT	No. of class
MODULE 1	Number system and Codes: Binary, Octal and Hexadecimal representations and their conversion, BCD, Gray codes, code conversion. Representation of Signed binary numbers with1's and 2's complement methods, Binary arithmetic. Boolean Theorems and Postulates, Logic gates, Forms of Boolean expressions: SOP, POS, Canonical forms, Simplification using Boolean theorems and Karnaugh map.	**10**
MODULE 2	Combinational Circuit Design: Half adder, Full adder, Half subtractor, Full subtractor, Serial and Parallel Adders, Multiplexers, Encoder, Decoder, Demultiplexer.	**7**
MODULE 3	Sequential Logic Design: Introduction to SR, D, JK, T Latches and lip-lops, Master-slave JK FF, Asynchronous counter: Mod 8, Mod 16, Mod 10, Synchronous counter design: Mod 8, Mod 10 Ring counter, Twisted ring counter, Shift registers.	**10**
MODULE 4	Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices.	**6**
MODULE 5	VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation	**8**
MODULE 6	VHDL constructs and codes for combinational and sequential circuits	**4**

Text /Reference Books

1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill.
2. R. Anand, Digital System Design Using VHDL, Khanna Book Publishing Company.
3. R. Anand, Digital Electronics, Khanna Book Publishing Company.
4. Douglas Perry, “VHDL”, Tata McGraw Hill.
5. Gothman, “Digital Electronics-An introduction to theory and practice”, Pearson Education 6. Douglas-Hall, “Digital Circuits and Systems”, Tata McGraw Hill
7. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill

BEC23103T	SIGNALS AND SYSTEMS	3L:0T:0P	3 Credits

Pre-requisites: *Mathematics*

Course outcomes:
At the end of this course students will demonstrate the ability to
CO1: Identify the sources of signals, and systems in real life.
CO2: Characterize different types of signals and systems.
CO3: Represent continuous-time and discrete-time systems in different mathematical forms.
CO4: Analyze system behaviour using time and frequency domain techniques.

Course Contents:

MODULE	CONTENT	No. of Class
MODULE 1	**Introduction to Signals & Systems** Signals and systems as seen in everyday life, and in various branches of engineering and science. Definitions and classifications of different types of Signals and Systems; Some special signals of importance: unit step, unit ramp, unit impulse. Signal properties: periodicity, absolute integrability. Signal operations: scaling, shifting, inversion. System properties: linearity, additivity and homogeneity, causality, stability. Types of system like linear and non-linear, casual and anti-causal, time variant and invariant, stable and unstable, reversible and irreversible and memoryless and with memory	10
MODULE 2	**LTI Systems** Linear time-invariant (LTI) systems, impulse response and step response, convolution. Characterization of causality and stability of linear time-invariant systems. System representation through differential equations and difference equations.	8
MODULE 3	**Sampling Theorem** The Sampling Theorem and its implications- under-sampled, critically-sampled, and over-sampled. Aliasing and its effects..	5
MODULE 4	**Fourier Analysis** Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Discrete-Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Short-time Fourier Transform (STFT), Wavelet Transform (WT), Parseval's Theorems.	12

MODULE 5	**Laplace and Z-Transform** Definition and properties of Laplace and Z-transform, Laplace domain analysis, solution to differential equations and system analysis with Laplace transform. Region of convergence for Z transform, Z-domain analysis. Inverse Laplace and Z-transform.	**8**
MODULE 6	**State-Space Analysis** State-space analysis and multi-input multi-output representation	**2**

Text Books/ References:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous andDiscrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
6. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
10. Ashok Ambardar, "Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.

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BEC23104T	NETWORK THEORY	3L:0T:0P	3 Credits

Pre-requisites: *Basics on current and voltage calculations*

Course outcomes:
At the end of this course students will demonstrate the ability to
- CO1: Understand and apply nodal and mesh analysis.
- CO2: Understand and apply electrical network theorems.
- CO3: Apply Laplace Transform for steady state and transient analysis.
- CO4: Determine different network functions.
- CO5: Appreciate the frequency domain techniques.

Course Contents:

MODULE	CONTENT	No of Classes
MODULE 1	Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC circuits.	10
MODULE 2	Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.	8
MODULE 3	Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.	8
MODULE 4	Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.	14

Text /Reference Books

1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill,1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education
4. Ashfaq Husain, Networks and Systems, Khanna Book Publishing, 2021.

BEC23105T	**DATA STRUCTURE**	**3L:0T:0P**	**3 Credits**

Pre requisite: Object oriented programming

Course Outcomes:

After completion of course, students would be able to:

- **CO1:** Understand the different types of data structure to be implemented using any programming language.
- **CO2:** Choose the data structures that effectively model the information in a problem and analyse the efficiency trade-offs (run time and memory usage) among alternative data structure implementations or combinations.
- **CO3:** Design, implement, test, and debug programs using a variety of data structures including stacks, queues, hash tables, binary and general tree structures, search trees, and graphs
- **CO4:** Apply efficient data structure (linked lists, stacks and queues) to solve a particular problem

Course Contents:

MODULE	CONTENT	No. of Classes
MODULE 1	**Introduction and Elementary Data Structures** Introduction to Data Structures and data types, Efficient use of memory, Recursion, time and space complexity of algorithms, Big O Notation and theta notations. applications of data Structures and algorithms	**5**
MODULE 2	**Linear Data Structure** 1-D Arrays and multi-dimensional arrays, sparse matrices, Strings, Pointers, Linked Lists, types of linked lists, dynamic storage management, circular linked list, Applications of Linked lists, Stacks, Applications of Stacks- Infix, Postfix & Prefix conversions, evaluations of expressions, multiple, stacks, Queues and its Applications, Dequeues, priority queues, Garbage collection, Josephus Problem.	**12**
MODULE 3	**Trees** Basic terminology, binary trees, binary tree traversal, representations of binary tree, application of trees, decision tree, game trees, Threaded Trees, Binary Search Tree, AVL tree, B-tree, Red-Black trees	**10**
MODULE 4	**Graph Theory** Graph representations, directed and weighted graphs, Graph Traversals, Dijkstra's algorithm for shortest path, Prim's and Kruskal's Algorithm for Minimal Spanning tree.	**7**

MODULE 5	**Sorting and Searching** **Searching:** Linear search, binary search **Sorting**: Insertion sort, selection sort, bubble sort, quick sort, merge sort, heap sort, and Bucket sort	**5**
MODULE 6	**Hashing and Collision** Hashing and Hash Tables, Hash functions, properties and types of hash functions, collision and collision resolution techniques, Applications of hashing, advanced data structure applications.	**6**

Text Books/Suggested References:

1. Data Structures, R.S. Salaria, Khanna Book Publishing, 2019.
2. Data Structures and Program Design in C By Robert L. Kruse,C.L. Tondo, Bruce Leung, Pearson Education, 2007.
3. Expert Data Structures with C/ 3rd Edition, R.B. Patel, Khanna Book Publishing, 2020.
4. Expert Data Structures with C++/ 2nd Edition, R.B. Patel, Khanna Book Publishing, 2020.
5. Data Structures Using C & C++, By Langsam, Augenstein, Tanenbaum, Pearson Education, 1989.
6. Fundamentals of Data Structures, By Ellis Horowitz and Sartaj Sahni, Computer Science Press, 2011.
7. An introduction to data structures with applications, By J.P. Trembley & P.G. Sorensen, TMH, 2004.

BEC23101P	ELECTRONIC DEVICES LAB	0L:0T:2P	1 Credits

Course Outcome:

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

CO1: To become familiarize with the working of different diodes, transistors, CRO and measuring instruments.

CO2: Use the semiconductor devices in different circuits.

CO3: Measure and record the experimental data, analyze the results, and prepare a formal laboratory report.

LIST OF EXPERIMENT

1. To study the forward static characteristics of the P-N Junction diode.
2. To study characteristics of a Zener diode.
    a) To study a simple shunt type voltage regulator circuit using Zener diode.
    b) To find the voltage regulation of the above circuit.
3. To study Rectifier Circuits.
4. To plot the static collector characteristics of a bipolar junction transistor in the common emitter configuration.
5. To plot the static collector characteristics of a bipolar junction transistor in the common base configuration.
6. To plot the static collector characteristics of a bipolar junction transistor in the common collector configuration.
7. a) To plot the static drain characteristic of a n-channel junction field effect transistor in the common source configuration.
    b) To plot the transfer characteristics of the given JFEE.
8. a) To plot the static drain characteristic of a n-channel Power MOSFET in the common source configuration.
    b) To plot the transfer characteristic of the given MOSFET.

BEC23102P	**DIGITAL SYSTEM DESIGN LAB**	**0L:0T:2P**	**1 Credits**

Course outcomes:
On the completion of this laboratory course, the students will be able to:

- CO1: Simplify, design and implement Boolean expression/half and full adders using basic/universal gates.
- CO2: Design and implement the various combinational circuits.
- CO3: Design and implement the various sequential circuits
- CO4: Analyze the results, and prepare a formal laboratory report.

LIST OF EXPERIMENT

1. To familiarize with logic gate IC packages and to verify the truth tables of logic gates.
2. To verify Demorgan's theorem for 2 variables.
3. To design and verify a half adder and half subtractor using
   (a) minimum no. of logic gates and
   (b) NAND gate
4. To design and verify a full adder and full subtractor using
   (a) minimum no. of logic gates and
   (b) NAND gate
5. Design and implementation of parallel Binary adder
6. Design and implementation of
   a) BCD-to-excess-3code converter and vice versa.
   b) Gray-to-binary and vice-versa.
7. Design and implementation of one bit, two-bit magnitude comparators.
8. Design and set up a Multiplexer (MUX) using gates and ICs.
9. Implementation and verification of truth table for J-K flip-flop, Master-slave J-K flip-flop, D flip-flop and T flip-flop.
10. Design and implementation of Mod-N synchronous counter using J-K flip-flops.
11. Design and implementation of
    a) Ring counter and
    b) Johnson counter using 4-bit shift register
12. VHDL program: For logic gates verifications.
13. Program for design of a half adder and Full adder

BEC23103P	SIGNAL AND SYSTEM LAB	0L:0T:2P	1 Credits

Course Outcomes:
Upon successful completion of this course the students will be able to:

CO1: Understand basics of MATLAB syntax, functions and programming.
CO2: Generate and characterize various continuous and discrete time signals.
CO3: Perform the basic operations on the signals.
CO4: Design and analyze linear time-invariant (LTI) systems and compute its response.
CO5: Analyze the spectral characteristics of signals using Fourier analysis.
CO6: Analyze the systems using Laplace transform and Z-transform.

LIST OF EXPERIMENT

1. Define and sketch the following discrete time signals: a) unit step function u(n) b) unit impulse signal δ(n) c) unit ramp signal r(n) d) rectangular pulse signal of width 10 Use Subplot to plot the graphs in the same window
2. Sketch the following shifted unit step signals using subplot to plot on the same figure window. a) u(n+2) b) u(n-3) c) u(n+2) – u(n-3)
3. Generate the signal x(n)= u(n) - u(n-10). Decompose x(n) into odd and even components. Plot x(n) and the odd and even components using subplot.
4. Define and sketch the following continuous time signals: a) unit step function u(t) b) unit impulse function δ(t) c) unit ramp r(t) d) rectangular pulse signal of width 2 using sign function in MATLAB. Use Subplot to plot the graphs in the same window.
5. WAP to generate the following a) A 50 Hz sinusoidal signal sin(2πft) samples at 600 Hz. b) A sinc function c) A square wave.
6. Plot signals cos (2πt), cos(2πt+ π/2) and cos(2πt-π/2) on the same figure window on the same axis. Make use of proper markers, colour and legends to distinguish between the graphs.
7. Consider a continuous time signal x(t)=2sin πt for an interval 0≤t≤2π. Sample the continuous time signal with a sampling period of T=0.2s. Sketch the continuous time signal and discrete time signal using subplot.
8. Plot the exponentially varying sinusoid x(t)=4e-2t sin(6t-60°) , 0<t<4
9. Define the following piecewise continuous functions in MATLAB and plot them: a) x(t)= 1, -1 ≤ t < 0 -1, 0≤ t < 2 b) x(t) = et , -5 ≤ t ≤ 0 e -t , 0 < t ≤ 5 c) x(t)= sin(t), t < 0 t 2 , 0≤ t ≤ 1 1/t , t>1
10. Plot the signal x(t)=cos(πt) , -5≤t≤5. On the same plot, same axis, also show x(2t) and x(t/2)
11. Plot signal x(t)= et/2 , -5≤t≤1. using subplot, plot x(-t).
12. Plot the continuous time signals x(t) and h(t) given below using MATLAB commands. Find the convolution of the two signals and plot the convolution result. Use subplot to show all the three signals.

13. Determine the convolution of two sequences x(n)={1,4,3,2} and h(n)={1,3,2,1} and then plot it.
14. Given unit impulse response h(n)=sin(0.5n) for $n \geq 0$ and input x(n)=sin(0.2n) for $n \geq 0$. Compute the output response y(n). Plot x(n), h(n) and y(n) using subplot.
15. Write a function to plot the unit step function and using that function plot a) u(n), -7<n<n<n<6
16. WAP to find the Laplace transform of the following signals a) t b) te-at c) tn-1 /(n-1)! d) 3 sin(2t) + 3 cos(2t)
17. WAP to find the inverse Laplace transform of the following s-domain signals a) 2/s(s+1)(s+2) b) 1/(s2 +s+1)(s+2)
18. WAP to find the convolution of signals x(t)=t2-3t and h(t)=t using Laplace transform. WAP to find the Z transform of the following signals a)n b)an c) e-anT d) 1+n(0.4)n-1 WAP to find the inverse Z transform of the following signals 1/(1-1.5z-1 + 0.5 z-2) b) 1/(1+z-1)(1-z-1)2
19. WAP to perform the convolution of the following signals x(n)=(0.4)n u(n) and h(n)=(0.5)n u(n) using z transform.

BEC23104P	NETWORK THEORY LAB	0L:0T:2P	1 Credits

Course outcomes:
On the completion of this laboratory course, the students will be able to:

CO1: Analyze response of RL, RC & RLC circuits in time & frequency domains
CO1: Selection and application of appropriate theorem for network simplification.
CO2: Determine voltages and currents in a resonant circuit

LIST OF EXPERIMENT
1 Determination transient response of a RC circuit.
2 Determination transient response of a RL circuit.
3 To study frequency response f a Passive Low Pass Filter (LPF).
4 To study frequency response f a Passive High Pass Filter (HPF).
5 Verification of Thevenin’s Theorem.
6 Verification of Maximum Power Transfer Theorem.
7 Verification of principle of Superposition Theorem with dc sources.
8 Verification of Reciprocity Theorem.
9 Determination of frequency response of a RLC circuit with sinusoidal ac

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BMA23213T	Probability Theory and Stochastic Processes	L	T	P	C
		2	1	0	3

Pre-requisite: Knowledge of Set Theory, Permutation and Combination

Course Outcome:

After completion of course, students would be able to:

CO1: develop understanding of basics of probability theory.
CO2: identify different distribution functions and their relevance.
CO3: apply the concepts of probability theory to different problems.
CO4: extract parameters of a stochastic process and use them for process characterization

Course Contents:

MODULE	CONTENT	No. of Class
MODULE 1	Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.	**12**
MODULE 2	Discrete random variables, probability mass function, probability distribution function, example of random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions; Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds..	**24**
MODULE 3	Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.	**12**
MODULE 4	Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density	**12**
Total Lecture hours		**60**

Text Book(s)

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing,'' Third Edition, Pearson Education.
2. A. Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes,'' Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International.
4. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

BCH23112T	ENVIRONMENTAL SCIENCE	2L:0T:0P	---

Pre-requisites: Biology, Sociology, Chemistry

Course outcomes:

At the end of this course students will demonstrate the ability to

CO1: Understand the basic concept of environment and ecosystem.

CO2: Value the natural resources, conservation of biodiversity and its importance.

CO3: Evaluate the problems of environmental issues such as pollution, population growth, climate change and its impact on human and environment and the control measures.

Course Contents:

MODULE	CONTENT	No. of Class
MODULE 1	**Concepts of Environmental Science** Definition of environment, scope and importance of environmental studies; Need for public awareness; Structure and functions in an ecosystem.	**3**
MODULE 2	**Natural Resources** Renewable and Non-renewable Resources; Forest, water, minerals, food and land resources (with example of one case study); Energy, growing energy needs, energy sources (conventional and alternative).	**6**
MODULE 3	**Biodiversity And Its Conservation** Biodiversity at global, national and local levels; India as a mega diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation	**5**
MODULE 4	**Environmental Pollution** Types of pollution-Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution –Rural /Urban/Industrial waste management [with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/Liquid waste management, disaster management.	**8**
MODULE 5	**Social Issues and Environment** From unsustainable to sustainable development; Problems relating to urban environment-Population pressure, water scarcity, industrialization, remedial measures; Climate change-Reasons, effects (global warming, ozone layer depletion, acid rain) with one case study; Legal Issues-Environmental legislation (Acts and issues involved), Environmental ethics.	**8**

Text /Reference Books

1. S.C. Santra: Environmental Science, New Central Book Agency
2. S.E. Manahan: Environmental Chemistry
3. K.V. Krishnamurthy: Textbook of Biodiversity
4. Agarwal, K.C., Environmental Biology, Nidi Publication Ltd., Bikaner, 2001.
5. Bharucha Erach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmadabad, 2002
6. Dr R J Ranjit Daniels and Dr Jagadish Krishnaswamy, Environmental studies-2010-Willey India