B.E. II YEAR
MA25XXX: MATHEMATICS – III

COURSE OUTCOMES:

Students should be able to:

1. Identify real phenomena as models of partial derivative equations. Solve real problems by identifying them appropriately from the perspective of partial derivative equations.
2. Demonstrate their understanding of the Dirichlet conditions by using them to evaluate infinite series. Calculate the Fourier transform of elementary functions from the definition.
3. Select and combine the necessary Laplace transform techniques to solve second- order ordinary differential equations involving the Dirac delta (or unit impulse).
4. To understand the concept of solving differentiation and integration using approximation methods.
5. Able to solve algebraic and differential equations using numerical method.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	1	-	70	30	-	-	100	4	-	4

Unit-1 Partial Differential Equations: Formation of Partial Differential Equations, Partial Differential Equations of first order and first degree i.e., Pp+Qq=R, Linear Homogeneous Partial Differential Equations of nth order with constant coefficient, Separation of Variables, Applications to Vibration of String and Transmission Line Equation.

Unit-2 Fourier Series and Fourier Transform: Definition and Derivations, Odd and Even functions, Half-Range Series, Change of Scale. Fourier Integral, Numerical Harmonic Analysis. Fourier Transforms: Sine and Cosine Transform, Applications of Fourier Transforms to solution of Partial Differential Equations.

Unit-3 Laplace Transform: Definition, Laplace Transform of elementary and periodic functions, properties of Laplace Transform and Transforms of derivatives, Inverse Laplace Transform and its properties, Convolution Theorem, Applications of Laplace Transform to solution of linear differential equations with constant and variable coefficients, Simultaneous differential equations.

Unit-4 Calculus of Finite Differences: Difference table, Operators E and Δ, Newton's forwardand backward interpolation formula, Lagrange's interpolation formula, Differentiation and Integration, Difference Equations with constant coefficients.

Unit-5 Numerical Methods: Solution of Algebraic and Transcendental equations using Bisection method, Regular-Falsi method and Newton Raphson method. Numerical solution of simultaneous equations: Gauss Elimination method, Gauss Seidel method. Numerical
solution of ordinary differential equations: Taylor's, Picard's and Runge- Kutta method.

Text Books

1. Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing CompanyLtd., New Delhi, 2006.
2. Balagurusamy E., Numerical Methods, Tata McGraw-Hill Publishing Company Ltd.,New Delhi, 1999.

Reference books

1. Kreyszig Erwin, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.
2. Jain, R.K. and S.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, New-Delhi, 2006.
3. Vedamurthy V.N. and Iyengar S.N., Numerical Methods, Vikas Publishing, 2008.
4. Das H. K, Higher Engineering Mathematics, S. Chand New Delhi, 2011.

Assessment

1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%)
2. End semester Theory Exam (70%)

EC25XXX: ELECTRONIC DEVICES

PREREQUISITE: Mathematics-I, Physics

COURSE OUTCOMES:

Student should be able to:

1. Analyse the characteristics and theories in semiconductor materials.
2. Illustrate the operating principle and characteristics of various types of diode, solar cell, & lithium ion battery and analyse diode based electronics circuits.
3. Analyze and design BJT based electronic circuits.
4. Design various applications based on JFET and MOSFET.
5. Acquire the knowledge of fabrication methods of integrated circuits and construction, characteristics & applications of special devices such as DIAC, TRIAC, UJT Phototransistor, Opto-isolator, display unit.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

Unit 1. Introduction to semiconductor Physics: Bohr's atomic structure, E-K diagrams, Periodic Lattice, energy bands in Intrinsic and Extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors carrier transport, drift and diffusion current, mobility and resistivity, Generation & recombination of carrier, Poisson & continuity equation, Transient and diffusion capacitances, Switching time, Hall effect.

Unit 2. Small signal switching model of P-N junction diode, Avalanche and Zener breakdown & its applications as a voltage regulator, PN junction diode circuits and applications: clipper, clamper, rectifiers, voltage multipliers, Special types diodes: LED, photodiode, tunnel, Schottky their construction, working, characteristics and applications. Solar cell, thermistors.

Unit 3. Charge transport in BJT, Minority carrier distribution and terminal currents, base width modulation, Ebers Moll model, I-V characteristics for CB, CE and CC configurations. Concept of load line, Transistor Biasing circuit design: Fixed biased configuration, Emitter-bias configuration, Voltage divider bias configuration, collector feedback configuration, Emitter follower configuration, Stability concepts. Thermal runaway, Transistor based regulated power supply design.

Unit 4. Review of construction & characteristics of p-channel, n-channel FET/JFET. MOSFET: Depletion type, Enhancement type MOSFET, MOS Capacitance, C-V characteristics. CMOS: constructions, characteristics and applications. I-V characteristics, JFET Biasing: Fixed-bias, Self-bias, voltage divider, source follower, common-gate. Channel length modulation.

Unit 5. Concepts of Integrated circuits and their fabrications. Introduction of Surface mount devices (SMDs), Silicon controlled rectifiers: construction, operation, characteristics, and applications. DIAC, TRIAC, UJT, Phototransistor, Opto-isolator. Display units: Seven segments- common anode, common cathode, Liquid Crystal Displays.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Milliman & Halkias, Integrated Electronics, 2nd ed., 1997 McGraw Hill Pub.
2. Boylestad R., Electronic Devices and Circuit Theory, 7th ed., 2004 PHI.
3. Sedra & Smith, Microelectronic circuits.5th ed., 2004 Oxford university press.

REFERENCE BOOKS RECOMMENDED:-

1. Ben G. Streetman, Solid State Electronics Devices, 5th ed., 2000, PHI.
2. Bhargava, Gupta & kulshreshtha, Basic Electronics and Linear Circuits, 2nd ed., 1990, Tata McGraw Hill Education
3 R.S.Sedha, "A Textbook of applied electronics",2nd ed., 2000, S.Chand

EC25XXX: SIGNALS AND SYSTEMS

COURSE OUTCOMES:

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

1. Represent mathematically and analyze different types of signals and systems.
2. Define various properties of LTI systems and determine the response of an arbitrary excitation.
3. Analyze continuous and discrete systems in time and frequency domain using Fourier transforms.
4. Apply the knowledge of Laplace Transform and z-Transforms to analyze LTI systems.
5. Apply sampling and reconstruct a signal and understand applications of signals and systems.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	0	0	100	3	-	3

UNIT 1: Signals and Systems:

Introduction to signals and systems and their applications in engineering and science. Type of signals: periodic and aperiodic signals, continuous and discrete-time signals, continuous and discrete amplitude signals, energy and power signals, even and odd signals, deterministic and random signals. Elementary continuous-time and discrete-time signals: unit impulse, unit step, ramp, exponential, signum and sync functions. Operations on signals, Types of systems, continuous-time and discrete-time systems, systems with and without memory, system properties: linearity, time-invariance, causality, stability, invertibility and inverse systems.

UNIT 2: Linear Time-Invariant (LTI) systems:

Discrete-time LTI systems: The convolution sum, Continuous-time LTI systems: The convolution integral, impulse response and step response of LTI systems, properties of LTI systems: causality, stability and invertibility. System representation through linear constant coefficient differential and difference equations (LCCDE).

UNIT 3: Fourier analysis of signals and systems:

Fourier series representation of periodic signals: Trigonometric and exponential forms, properties of Fourier series, Continuous-time and Discrete-Time Fourier transform representation of signals and their properties, Fourier transforms of standard signals, aperiodic and periodic signal transmission through LTI systems, Parseval's theorem, the impulse response and frequency response of LTI systems and their relationship, Magnitude and Phase response, Time and frequency domain aspects of systems, filtering.

UNIT 4: Laplace and Z transform:

Laplace transform, the region of convergence of Laplace transform, transfer function, poles and zeros of a continuous-time system, properties of Laplace transform, inverse Laplace transform, analysis and characterization of LTI systems using Laplace transform: Transfer function of LTI systems, system behavior, causality, stability and Unilateral Laplace Transform.

Z-transform, ROC of Z-transform, properties of Z-transform, inverse Z-transform, analysis and characterization of LTI systems using Z-transform: system function of discrete time LTI systems, system behavior, causality, stability, Unilateral Z Transform.

UNIT 5: Sampling and applications of signals and systems:

The sampling theorem, Time-domain and frequency-domain analysis of sampled signals, aliasing. Reconstruction of signals from its samples: ideal interpolator, zero-order hold, first-order hold. Applications of signals and systems.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Signals and Systems: Alan. V. Oppenheim, Allan S. Willsky and S. Hamid Nawab, 2nd Edition, Prentice Hall.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, “Signals and Systems-Continuous and Discrete”, 4th edition, Prentice Hall, 1998.
3. Signals and Systems: Tarun Rawat, Oxford Higher education.

REFERENCE BOOKS RECOMMENDED:

1. Signals and Systems: Hwei P Hsu, Schaum’s Outline Series, 2nd Edition, Tata Mc-Graw Hill Education Private Limited.
2. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998.
3. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, 1998.

EE25XXX: NETWORK THEORY & ANALYSIS

PREREQUISITE: Fundamental of electrical engineering, mathematics**.**

COURSE OUTCOMES:-

Student should be able to:

1. Apply the knowledge of basic physics and mathematics to develop approximate circuit model of practical elements. Formulation of circuit equations using Kirchhoff's law and network topology.
2. Infer and evaluate transient response, steady state response in time and frequency domain, determine different network functions and analyze the series and parallel resonant circuit.
3. Develop and evaluate two-port model and its parameters, design attenuators, filters and equalizers.
4. Apply the network reduction techniques and network theorems to obtain solution of network
5. Analysis of polyphase circuits and Fourier analysis of various waveforms.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

UNIT: 1 Lumped circuits and Kirchhoff's Laws, Circuit elements, physical components v/s circuit elements, Power and energy, Passivity. Network Topology, Loop and Nodal equations, State equations.

UNIT: 2 First and State Second order networks zero state, zero input, transient and steady state response. Solution of network equations using Laplace transform, Network functions, their pole zero description.

UNIT: 3 Two port networks, various two port network parameters and their interrelationships.

UNIT: 4 Sinusoidal steady state analysis, frequency response, resonance, complex power, power factor improvement, maximum power transfer theorem, locus diagram, Superposition, Reciprocity, Thevenin's and Norton's theorem.

UNIT: 5 Magnetically coupled circuit, analysis of circuits with controlled sources. Analysis of balanced and unbalanced polyphase circuits. Fourier analysis of periodic waveforms, frequency spectrum, Power and energy of complex waveforms.

ASSESSMENT:

A. Continuous evaluation through two mid-term test with a weightage of 30% of the total marks. It includes class attendance as well as assignments on the course topics.
B. The end-term theory examination weightage is 70%.

TEXT BOOKS RECOMMENDED:

1. M.E Van Valkenburg, "Network Analysis", Third Edition, PHI, New Delhi, 1998.
2. Desoer and Kuh, "Basic circuit theory", Tata McGraw Hill Edition 2009.
3. William Hart Hayt, Jack E. Kemmerly, Steven M. Durbin, "Engineering Circuit Analysis", Eight Edition, McGraw-Hill Higher Education, 2012.

REFERENCES BOOKS:

1. Ronald E. Scott, “Linear circuits Vol.I and II”, Addison-Wesley Publication, 2007.
2. Joseph A Edminister, “Electric circuits Schaum’s outlines”, Fifth Edition, Tata McGraw Hill Education Private Limited 2009.
3. G K Mithal, “Network Analysis”, Khanna Publication, edition 2011.
4. Robert L. Boylestad, “Introductory Circuit Analysis”, Twelfth Edition, Pearson Education Limited, 2012.

EC25XXX: DIGITAL SYSTEM DESIGN

PREREQUISITE: - Engineering Physics, Electronic Devices

COURSE OUTCOMES:-

Student should be able to:

1. Solve the logical expressions through Boolean algebra and k-map.
2. Implement variety of logical devices using combinational circuits concepts.
3. Analyze sequential circuits like Registers and Counters using flip-flops.
4. Classify different logic families, semiconductor memories and PLD devices.
5. Design converters which facilitate the conversion of real world analog signals to digital and vice versa.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

UNIT 1: Introduction to digital logic: Review of logic gates & Boolean Algebra, De Morgan Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Quine-Mccluskey method, Implementation of Boolean functions using basic & Universal gates, Mutlilevel implementation using NAND-NOR gates, Binary codes-Weighted/Non-weighted.

UNIT 2: Combinational Logic: Arithmetic circuits: Adders, Subtractors, Comparators. Multiplexers, De-multiplexers, Encoder, Decoder, Serial and Parallel Adders, BCD Adder, Parity Generators & checkers. Code Converters: Binary-to-Gray, Gray-to-Binary, BCD-to-Excess-3, Excess-3-to-BCD.

UNIT 3: Sequential Logic Design: Reviews of Flip-flops: Circuits, characteristics/excitation table. Triggering levels of Flip-flops, conversions between Flip-flops, Race-around condition and its remedies. Shift registers, Synchronous & Asynchronous counters, Decade counters, Up-Down counters, Johnson & Ring counters. Design of Modulo-N counters.

UNIT 4: Logic Families and Semiconductor Memories: Types: RTL, DTL, TTL, ECL, HTL, IIL. NMOS, PMOS & CMOS families. Specifications : Noise margin, Propagation delay, fan-in, fan-out, Comparisons of logic families. Classification of Memories – Static, Dynamic, DDR, PROM, EPROM, EEPROM. Concept of address lines and data lines Programmable logic devices like PLA, PAL. Logic functions implementation using Programmable Devices.

UNIT 5: Applications of digital circuits: Analog to Digital and Digital to Analog converters: Types, Performance parameters like accuracy, processing time, resolution, linearity. Sample and hold circuits, Multivibrators: Bistable, Monostable, Astable. Transistor/IC based Multivibrator circuits. Schmitt trigger, IC555, IC565 & their applications.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989.
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

EC25XXX: ELECTRONIC DEVICES LAB

COURSE OUTCOMES:

Student should be able to:

1. Operate measuring instruments such as CRO, Digital multimeter, etc.
2. Understand the operation of various diodes and plot its I-V characteristics.
3. Implement various diode circuits such as clipper circuits', clamper circuits' voltage regulator, rectifier with and without, filter, etc.
4. Understand the operation and biasing circuits of BJT, its testing and characterization in CE, CB, CC configuration.
5. Understand the characteristics of JFET and MOSFET.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
-	-	2	-	-	20	30	50	-	1	1

LIST OF EXPERIMENTS:

S. No.	List of Experiments
1.	To determine the deflection sensitivity of CRO.
2.	Study of V- I characteristics of PN junction diode and LED.
3.	To study the use of diodes in wave-shaping (clipper) circuits and in level-shifting (clamper) circuits.
4.	Study of Zener diode characteristics.
5.	To study Zener diode as voltage regulator.
6.	Study of different types of rectifiers.
7.	Study of different types of filters.
8.	Testing of transistor.
9.	Study of transistor's characteristics in CE (Common emitter) configuration.
10.	To study BJT characteristics in CB (Common base) configuration.
11.	To study the characteristics of BJT in CC (Common collector) configuration.
12.	Study of transistor's characteristics of JFET.
13.	Study of transistor's characteristics of MOSFET.
14.	To study fixed bias circuit with and without emitter resistor.
15.	Study of collector to base bias circuit.
16.	Study of potential divider biasing circuit.
17.	Project design.

ASSESMENT: Internal viva, Continuous evaluation of experiments, Journal write-up, andAdditional experiments conducted, Quiz, End semester exam.

EE25XXX: NETWORK THEORY AND ANALYSIS LAB

COURSE OUTCOMES:

Student should be able to:

1. Analyze complicated circuits using different network theorems.
2. Apply the knowledge of basic circuital law and simplify the network.
3. Infer and evaluate transient response, Steady state response, and network functions.
4. Obtain the maximum power transfer to the load, and analyze the series resonant and parallel resonant circuit.
5. Evaluate two port network model and its parameters.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
-	-	2	-	-	20	30	50	-	1	1

LIST OF EXPERIMENTS:

S. No.	List of Experiments
1.	To determine the equivalent networks by application of Thevenin's Theorem.
2.	To determine the equivalent networks by application of Norton's Theorem.
3.	To plot current with respect to time and evaluate time constant of Transient in RC circuits.
4.	Analyzed salient feature of series and parallel resonance circuits and draw its characteristics.
5.	To verify the voltage and current relations in star and delta connected systems.
6.	To validate open circuit parameter and short circuit parameter for two port network.
7.	Illustrate linearity property of a circuit using superposition theorem.
8.	Verification of reciprocity theorem.
9.	Evaluate power versus load curve and verify maximum power transfer theorem.
10.	Designing of Passive Low-pass and High-pass Filters.

ASSESSMENT:

A. Continuous evaluation of laboratory journals with a weightage of 40%. It includes lab attendance as well as experiments performed in the lab.

B. The end-term practical examination weightage is 60%.

EC25XXX: DIGITAL SYSTEM DESIGN LAB

COURSE OUTCOMES:

Student should be able to:

1. Familiarize with logic gates and design basic digital logic circuits.
2. Simplify the Boolean expressions and design multilevel logic circuits for arithmetic operations.
3. Construct basic combinational circuits and verify their functionalities.
4. Apply the design procedures to implement basic sequential circuits
5. Analyze sequential circuits like Registers and Counters using flip-flops.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
-	-	2	-	-	20	30	50	-	1	1

LIST OF EXPERIMENTS:

S.No.	List of Experiments
1.	To study various logic gates.
2.	To verify properties of NAND and NOR Gates as universal building block.
3.	Simplification & Implementation of Boolean functions.
4.	Implementation of basic Boolean arithmetic logic circuits.
5.	Implementation of even & odd parity generator & checker.
6.	Conversion from binary to gray and gray to binary code.
7.	To verify 2-bit magnitude comparator for all possible conditions.
8.	Connection of various logical functions using 8-to-1 multiplexer.
9.	Construction of a 4-bit ripple counter & study of its operation.
10.	Design and implement of various types of flip-Flop using JK flip Flop
11.	Design of a 3- bit synchronous counter & study of its operation.
Lab. Project	
1.	To design and develop a IC 555 based Bistable multivibrator.

ASSESMENT: Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

HU 22005/24005/25005/27005: ECONOMICS FOR ENGINEERS

PRE-REQUISITES: NIL COURSE

COURSE OUTCOMES: after completion of course, the students will be able to:

CO-1: Explain economic cyclic flow and Estimate the demand and demand elasticity for a product.

CO-2: Plan the production; choose appropriate production technology (combination of production factors); and estimate feasible range of production.

CO-3: Analyze the production-cost-profit relation and select the suitable project for investment

CO-4: Estimate price and the equilibrium for a firm/organization in different competitive market situations.

CO-5: Review, summarize and compare the financial statements of an accounting entity and able to apply financial ratio technique for financial analysis.

CO-6: Identify the problems, see the opportunity, and ideate the solution to the problems.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
2	-	-	70	30	-	-	100	2	-	2

UNIT 1.Nature and scope of economics, Economic cyclic flow, Central Economic problems, macro and micro economics, concept, determinants and law of demand and supply, Elasticity of demand, Equilibrium price, consumer surplus and equilibrium.

UNIT 2. Production, cost and Revenue: Production function, laws of return to variable proportion, Laws of return to scale, cost concepts, cost functions and their inter relation, Revenue Concepts and functions, break- even analysis, Time value of money and Investment analysis- NPV, IRR, ARR and payback period method.

UNIT 3. Pricing and Market: Price determination and firm's equilibrium under perfect competition and monopoly, price-output determination under monopolistic competition, kinked demand curve, collusive and non-collusive oligopoly.

UNIT 4. Entrepreneur, entrepreneurship and start-up, characteristics of an entrepreneur, forms of business organization, phases of startup, small medium and large scale enterprise, problems, opportunities, Design Thinking and Ideation. Business model.

UNIT 5. Accountancy: Accountancy and bookkeeping, GAAP, Assets, Liabilities and Capital, types of accounts, Journal, Ledger, Trial Balance and Financial Statements, Financial Ratio Analysis.

ASSESSMENT: Through End-Sem. Theory Exam, Theory sessionals, Mid-Sem Tests, and Assignments

Books & Reference Recommendation:

1. JhingalM.l., Economics of development and Planning, Vrinda Publication (40th Ed./latest).
2. Ahuja H. L., Advance economic theory, S Chand Publication, (21st Ed./Latest)
3. Riggs, Bedworth and Randhawa, Engineering Economics, Tata McGraw-Hill, (4th Ed./latest)
4. Principles of accountancy, Nirmal Jain,
5. Entrepreneurship by Rajeev Roy, 2nd edition
6. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hallof India, New Delhi, 2004.
7. Introduction to the Constitution of India, D.D. Basu

CHM2002: ENVIRONMENTAL SCIENCE

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
2	-	-	-	50	-	-	50	2	-	2

UNIT- I: Environment: General Studies

a. Introduction, segments of environment, Energy flow in environment, Composition and structure of atmosphere. Chemical Species and particulates in atmosphere. Reaction and Phenomena occurring in atmosphere.
b. Man and Environment

Unit II: AIR Pollution

a. Air pollution: Sources and effects, particulate control, control of gaseous pollutants (SOx, NOx, oxides of carbon, hydrocarbon pollutants), Air Quality standards and Management.
b. Case studies

UNIT- III: Water Pollution

a. Water Pollution: Types of water pollution, sources, water pollution control. Waste water treatment technologies and Recycle.
b. Case studies.

UNIT- IV: Soil and Noise Pollution

a. Soil Pollution: Introduction, sources/causes, effects and control.
b. Noise Pollution: Introduction, sources/causes, effects and control, noise measuring instruments and noise pollution control technology.

UNIT- V: Environment, Society and Ethics

a. Society and Environment, Solid waste-types, impact on society, solid waste management,specific applications to solid waste management.
b. Environmental Ethics: Need and Types, Regulations: ISO 14000, 9000, pollution Acts andRegulations. Environmental Auditing

Text Books:

1. S.C. Bhatia, “Environmental Pollution and control in chemical process industries”, KhannaPublishers, 1st edition, 2001.
2. C.S.Rao, “Environmental Pollution Control Engineering”, Wiley Eastern, 1992.

Reference Books:

1. S.P.Mahajan, “Pollution control in Process Industries”, Tata McGraw Hill, 1990.
2. F. P. Lees, “Loss prevention in process industries”, 2nd edition., Butter worth-Heinemann,1996.
3. Martin Crawford, “Pollution Control Theory”, McGraw Hill, 1976.
4. Marell, “Solid Wastes”, John Wiley, 1975.