Bachelor of Technology (Electronics & Communication Engineering)

Scheme of Studies/Examination

Semester III

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs)
			L	T	P	Hours/Week	Theory	Sessional	Practical	Total	
1	AS-201N	Mathematics-III	3	1	0	4	75	25	0	100	3
2	ECE-201N	Signals & Systems	3	1	0	4	75	25	0	100	3
3	ECE-203N	Electronic Devices	3	1	0	4	75	25	0	100	3
4	ECE-205N	Network Analysis & Synthesis	3	1	0	4	75	25	0	100	3
5	ECE-207N	Digital Electronics	3	1	0	4	75	25	0	100	3
6	ECE-209N	Analog Communications	3	1	0	4	75	25	0	100	3
7	ECE-211N	Signals & Systems Lab	0	0	3	3	0	40	60	100	3
8	ECE-213N	Digital Electronics Lab	0	0	3	3	0	40	60	100	3
9	ECE-215N	Analog Communications lab	0	0	3	3	0	40	60	100	3
		Total	**18**	**6**	**9**	**33**	**450**	**270**	**180**	**900**	
10	MPC-201N	Environmental Studies*	3	0	0	3	75	25	0	100	3

* MPC-201N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.

AS-201N	MATHEMATICS-III					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	1	0	75	25	100	3 hrs
Purpose	To acquaint the students with the basic use of PDE, Linear Programming problems, Fourier series and transforms, Complex variables and Probability.					
Course Outcomes						
CO1	This section is concerned mainly with Fourier series. However, the underlying ideas can also be extended to nonperiodic phenomena. This leads to Fourier integrals and transforms which are very much useful in solving the initial and boundary value problems.					
CO 2	Students will learn about the formation and solution the partial differential equations. First order PDE of any degree by using Charpit's method will be discussed in details. In addition, how to solve homogeneous linear PDE with constant coefficients and variable separable method and LPP will be covered under this section.					
CO 3	Complex analysis is concerned with generalization of the familiar real functions of calculus and their detailed knowledge is an absolute necessity in practical work to solve engineering problems.					
CO 4	Probability theory provides models of probability distributions(theoretical models of the observable reality involving chance effects) to be tested by statistical methods which has various engineering applications, for instance, in testing materials, control of production processes, robotics, and automatization in general, production planning and so on.					

UNIT-I

Fourier Analysis (11 hrs)

Fourier series: Euler's formulae, Orthogonality conditions for the Sine and Cosine funtions, Dirichlet's conditions, Fourier expansion of functions having points of discontinuity, Change of interval, Odd and even functions, Half-range series.

Fourier Transforms: Fourier integrals, Fourier transforms, Fourier Cosine and Sine transforms, Properties of Fourier transforms, Convolution theorem, Parseval's identity, Fourier transforms of the derivative of a function, Application of transforms to boundary value problems (Heat conduction and vibrating string).

UNIT-II

Partial Differential Equations and LPP (11 hrs)
Formation and Solutions of PDE, Lagrange's Linear PDE, First order non-linear PDE, Charpit's method, Homogeneous linear equations with constant coefficients, Method of separation of variables.

Solution of linear programming problems: using Graphical and Simplex methods.

UNIT-III

Theory of Complex Variables (12 hrs)
A review of concept of functions of a complex variable, Limit, continuity, differentiability and analyticity of a function. Basic elementary complex functions (exponential functions, trigonometric & Hyperbolic functions, logarithmic functions) Cauchy-Riemann Equations.

Line integral in complex plane, definition of the complex line integral, basic properties, Cauchy's integral theorem, and Cauchy's integral formula, brief of Taylor's, Laurent's and Residue theorems (without proofs).

UNIT-IV

Probability theory: **(11 hrs)**
A review of concepts of probability and random variables: definitions of probability, addition rule, conditional probability, multiplication rule, Conditional Probability, Mean, median, mode and standard deviation, Bayes' Theorem, Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function.
Standard Distributions: Binomial, Poisson and Normal distribution.

References Books:
1. E. Kreyszig : Advanced Engineering Mathematics, Wiley India.
2. B. V. Ramana: Engineering Mathematics, Tata McGraw Hill.
3. R.K. Jain, S.R.K. Iyengar: Advanced Engineering Mathematics, Taylor & Francis.
4. Murray R Spiegel: Schaum's Outline of Complex Variables, McGraw Hill Professional.
5. Michael D. Greenberg: Advanced Engineering Mathematics, Pearson Education, Prentice Hall.

Note: The Examiners will set nine questions: first question will be short answer type (covering the entire syllabus) and another eight questions will be set taking two questions from each unit. Students will have to attempt five questions in all; first question will be compulsory and other four questions, selecting one from each unit. All questions will carry equal marks.

ECE-201N	Signals and Systems					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	1	0	75	25	100	3 Hr.
Purpose	To familiarize the students with the basic concepts of signals and systems, Random variables, discretisation of analog signals, fourier series, fourier transform and laplace transform.					
Course Outcomes						
CO1	Introduce and classify signals and systems based on their properties.					
CO2	To understand the basic concepts of random variables and Linear time invariant systems.					
CO3	Familiarization with the sampling process and spectral analysis of signals using fourier series.					
CO4	Apply transform techniques to analyze continuous-time and discrete-time signals and systems					

Unit-I

Introduction to Signals: Continuous and discrete time signals, deterministic and stochastic signals, periodic and a periodic signals, even and odd signals, energy and power signals, exponential and sinusoidal signals and singular functions. Signal representation in terms of singular functions, orthogonal functions and their use in signal representation

Introduction to Systems: Linear and non-linear systems, time invariant and time varying systems, lumped and distributed systems, deterministic and stochastic systems, casual and non-causal systems, analog and discrete/digital memory and memory less systems.

Unit-II

Random Variables: Introduction to Random Variables, pdf, cdf, moments, distributions, correlation functions.

Linear Time Invariant Systems: Introduction to linear time invariant (LTI) systems, properties of LTI systems, convolution integral, convolution sum, causal LTI systems described by differential and difference equations. Concept of impulse response

Unit-III

Discretisation of Analog Signals: Introduction to sampling, sampling theorem and its proof. Effect of undersampling, reconstruction of a signal from sampled signal.

Fourier Series : Continuous time fourier series (CTFS), Properties of CTFS, Convergence of fourier series, Discrete time Fourier Series (DTFS), Properties of DTFS , Fourier series and LTI system, Filtering.

Unit-IV

Fourier Transform: Continuous Time Fourier Transform (CTFT), Properties of CTFT, Systems characterized by linear constant- coefficient differential equations.

Discrete time fourier transform (DTFT), Properties of DTFT, Duality, Systems characterized by Linear constant coefficient difference equations.

Laplace Transform: Introduction to Laplace transform, Region of convergence for laplace transform, Inverse laplace transform, Properties of laplace transform, Analysis and characterization of LTI systems using laplace transform, System function algebra and block diagram representations, Unilateral laplace transform.

Text Books:
1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems, Prentice Hall India, 2nd Edition, 2009

Reference Books:
1. Simon Haykins – "Signal & Systems", Wiley Eastern
2. Tarun Kumar Rawat , Signals and Systems , Oxford University Press.

Note: Question paper template will be provided to the paper setter.

ECE - 203N	Electronic Devices					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	1	0	75	25	100	3 Hr.
Purpose	To familiarize the students with the various electronic devices such as various types of diodes, BJT's, FET's and regulated power supplies.					
Course Outcomes						
CO1	To understand the concept of carrier transport phenomena in semiconductors and various diodes such as p-n junction diode, tunnel diode and schottky diodes.					
CO2	To understand the detailed concept of BJT's and calculation of parameters of transistors using different models.					
CO3	Describe the characteristics & parameters of FET's and MOSFET's.					
CO4	To understand the concept of different types of regulated power supplies.					

Unit- I

Carrier Transport Phenomena: Carrier Drift, Carrier Diffusion, Hall Effect, Mobility and Resistivity. Generation and Recombination of carriers, Fermi energy level, its position and its variation with doping concentration.**PN Junction**: Basic Structure, Built in potential Barrier, Electric Field, Space charge width, Junction capacitances: Depletion & Diffusion Capacitance, Small signal model of PN Junction Diode. Tunnel Diode, Schottky Diode**.**

Unit- II

Bipolar Junction Transistor: Basic principle of operation, Forward Active mode & other modes. Non Ideal Effects: Base Width Modulation, Current Crowding, High Injection. Ebers-Moll Model, Frequency Limitations of BJT'S, Hybrid Pi Model, Introduction to H-Parameters, Hetrojunction Bipolar Transistors.

Unit -III

Field Effect Devices: JFET concepts, Basic Operation, Internal pinch off voltage, Pinch off voltage, Ideal DC current voltage relationship, Transconductance, Channel length modulation, velocity saturation effects, Small Signal Model & Frequency Limitations.Two Terminal MOS structure, Energy band diagrams, Depletion layer thickness, Capacitance Voltage Relationship, Basic MOSFET operation, Small Signal Model.

Unit-IV

Regulated Power Supplies: Voltage Regulation, Zener diode shunt voltage regulator, Transistor series and Transistor shunt voltage regulator, Controlled Transistor Voltage Regulator, Op-Amp Series voltage regulator, Complete power supply and SMPS.

Text Books:
1. D. A. Neamen,DhrubesBiswas Semiconductor Physics and Devices (IRWIN), McGraw Hill Higher Education, 4th Edition
2. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi, 1995.

Reference Books:
1. E S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.
2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.
3. Millman&Halkias: Integrated Electronics, TMH.
4. Boylestad&Nashelsky: Electronic Devices & Circuit Theory, PHI.

Note: Question paper template will be provided to the paper setter.

ECE-205N	Network Analysis and Synthesis					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	1	0	75	25	100	3 Hr.
Purpose	To familiarize the students with the concepts of topology, transient analysis, network modeling, filters and methods of network analysis and synthesis for solving simple and complex circuits.					
Course Outcomes						
CO1	To understand the concept of network topologies and the network analysis in the time domain for solving simple and complex circuits.					
CO2	Describe the circuit element models, network analysis using Laplace transform and time domain behavior from the pole-zero plots.					
CO3	Describe the characteristics & parameters of two port networks.					
CO4	To understand the concept of filters and synthesis of one port network.					

Unit -I

Introduction: Principles of network topology, graph matrices, Network Analysis (Time-Domain): Singularity Functions, Source-Free RC, RL, Series RLC, Parallel RLC circuits, Initial & Final Conditions, Impulse & Step Response of RC, RL, Series RLC, Parallel RLC circuits.

Unit-II

Network Analysis (using Laplace Transform): Circuit Element Models, Transient Response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform.

Network Functions: Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions.

Unit-III

Characteristics and Parameters of Two Port Networks: Relationship of two-port variables, short-circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks.

Unit-IV

Types of Filters and their Characteristics: Filter fundamentals, constant-k and m-derived low-pass and high-pass filters.

Network Synthesis: Causality & Stability, Hurwitz Polynomials, Positive real functions, Synthesis of one port networks with two kind of elements.

Text Books:
1. Fundamentals of Electric Circuits: Charles K. Alexander, Matthew N. O. Sadiku, McGraw Hill Education
2. Network Analysis: M.E. Van Valkenburg, PHI

Reference Books:
1. Circuits & Networks: Sukhija & Nagsarkar, Oxford Higher Education.
2. Network Analysis & Synthesis: F. F. Kuo, John Wiley.
3. Basic Circuit Theory: Dasoer Kuh, McGraw Hill Education.
4. Circuit Analysis: G.K. Mithal; Khanna Publication
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Note: Question paper template will be provided to the paper setter.

ECE-207N	Digital Electronics					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	1	0	75	25	100	3 Hr.
Purpose	To familiarize the students with the concepts of Digital Electronics covering the contents of digital techniques, logic gates & logic families etc.					
Course Outcomes						
CO1	Students will be able to design a minimum circuit for any function					
CO2	Students will be able to analyze various logic families available to design digital components					
CO3	Students will be able to design state machine circuits using sequential and combinational circuits					
CO4	Students will be able to understand the basics of various PLD's.					

Unit-I

Introduction to Digital Techniques: Digital Systems; Logic circuits, Analysis, design and implementation of digital systems, Number Systems and Codes- Positional number system; Binary, octal and hexadecimal number systems; Methods of base conversions; Binary, octal and hexadecimal arithmetic; Representation of signed numbers; Fixed and floating point numbers; Binary codes: BCD codes, Excess-3, Gray codes; Error detection and correction codes - parity check codes and Hamming code.

Combinatonial Design using Gates: Combinatonial Logic Systems: Definition and specification; Truth table; Basic logic operation and logic gates. Basic postulates and fundamental theorems of Boolean algebra;Standard representation of logic functions : SOP and POS forms; Simplification of switching functions using K-map and Quine-McCluskey tabular methods; Synthesis of combinational logic circuits using AOI, NAND,NOR and other combination of other logic functions.

Unit-II

Logic families: Introduction to different logic families; Operational characteristics of BJT in saturation and cut-off regions; Operational characteristics of MOSFET as switch; TTL inverter - circuit description and operation; CMOS inverter - circuit description and operation; Structure and operations of TTL ,CMOS and ECL gates; Electrical characteristics of logic gates – logic levels and noise margins, fan-out, propagation delay, transition time, power consumption and power-delay product; interfacing of TTL and CMOS families.

Combinational design using MST devices: Encoders, Decoders, multiplexers, demultiplexers and their use as logic elements; Parity circuits and comparators; Arithmetic modules- adders, subtractors , BCD arithmetic circuits.

Unit-III

Sequential circuits: Definition of state machines, state machine as a sequential controller; Basic sequential circuits- latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop; Timing hazards and races; Analysis of state machines using D flip-flops and JK flip-flops; Design of state machines - state table, state assignment, transition/excitation table, excitation maps and equations, logic realization;

State machine design: Designing state machine using ASM charts, Designing state machine using state diagram, Design of registers, counters-asynchronous and synchronous, up/down counter, Ring and Johnson counters.

Unit-IV

Memory – Organization, Functional Diagram, Memory operations, Classification of semiconductor memories, Read and Write Memories, ROM, Programmable Logic Devices-PLAs, PALs and their applications, Generic Array logic devices, Sequential PLDs and their applications; Introduction to field programmable gate arrays (FPGAs) and ASICS.

Text Books:

1. G.K.Kharate: Digital Electronics,1st edition, Oxford university press, 2010

Reference Books:

1. M.M.Mano and M.D.Ciletti: Digital design4th edition, Printece Hall.2006
2. R.P.Jain: Modern Digital Electronics, 3rd edition, TMH.2003
3. A.A.Kumar: Fundamentals of digital circuits,2nd edition, Printece Hall of India
4. A.P.Malvino and D.P.Leach: Digital principles and applications,6th edition,TMH,2008
5. Z. Kohavi, Switching and Finite Automata Theory, McGraw Hill, 1970.

Note: Question paper template will be provided to the paper setter.

ECE-209N	Analog Communications					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	1	0	75	25	100	3 Hr.
Purpose	To familiarize the students with the concepts of basic communication systems and various noises in that system, different analog modulation techniques and also AM&FM transmission & reception with various pulse techniques.					
Course Outcomes						
CO1	To understand the concept of basic comm. System and various types of noise and analog modulation techniques.					
CO2	To understand the concept of AM transmission & reception.					
CO3	To understand the concept of FM transmission & reception.					
CO4	To understand the concept of SSB transmission & reception and analog pulse techniques.					

Unit-I

Communication Systems and Noise: Constituents of communication system, Modulation, Bandwidth requirement, Noise, Classification of noise, Resistor noise, Multiple resistor noise sources, Network with reactive elements, Noise Temperature, Noise bandwidth, Noise figure, its calculation and measurement, Bandpass noise representation, Noise calculation in Communication Systems, Noise in Amplitude Modulated System, Noise in angle modulated systems, SNR calculation for AM and FM.

Analog Modulation Techniques: Theory of amplitude modulation, AM power calculations, AM modulation with a complex wave, Concepts of angle modulation, Theory of frequency modulation, Mathematical analysis of FM, Spectra of FM signals, Narrow band FM, Wide band FM, Phase modulation, Phase modulation obtained from frequency modulation, Comparison of AM, FM & PM.

Unit-II

AM Transmission: Generation of Amplitude Modulation, Low level and high level modulation, Basic principle of AM generation, Square law modulation, Amplitude modulation in amplifier circuits, Vander bijl modulation, Suppressed carrier AM generation (Balanced Modulator) ring Modulator, Product Modulator/balanced Modulator.

AM Reception: Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver, RF Amplifier, Image Frequency Rejection, Cascade RF Amplifier, Frequency Conversion and Mixers, Tracking & and Alignment, IF Amplifier, AM detector, AM detector with AGC, Distortion in diode detectors, Double hetro-dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.

Unit-III

FM Transmission: FM allocation standards, Generation of FM by direct method, Varactor diode Modulator, Indirect generation of FM, The Armstrong method RC phase shift method, Frequency stabilized reactance FM transmitter, FM stereo transmitter, Noise triangle.

FM Reception: Direct methods of Frequency demodulation, Travis detector/frequency discrimination (Balanced stop detector), Foster seelay of phase discriminator, Ratio detector, Indirect method of FM demodulation, FM detector using PLL, Pre-emphasis / de-emphasis, Limiters, The FM receiver, RF

Amplifier, FM stereo receiver, Square, Triangular, Sinusoidal FM generation Voltage controlled oscillator.

Unit-IV

SSB Transmission: Introduction, Advantages of SSB Transmission, Generation of SSB, The Filter method The Phase Shift Method, The Third Method, AM Compatible SSB Modulation, Pilot Carrier SSB, Independent Side-band Systems (ISB), Vestigial Side-band Modulation (VSB), VSB-SC, Application of AM and FM in TV transmission.

SSB Reception: SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Pilot Carrier SSB Receiver, SSB Double Super-hetrodyne Receiver, Compatible SSB (CSSB) Receiver, ISB/Suppressed Carrier Receiver, Modern Communication Receiver.

Analog Pulse Modulation: Introduction, Pulse amplitude modulation (PAM), Natural PAM Frequency Spectra for PAM, PAM Time Multiplexing Flat-top PAM, PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), PPM Demodulator,

Text Books:

1. Proakis, J. G. and Salehi, M., Fundamentals of Communication Systems, Dorling Kindersley (2008) 2nd ed.
2. Mithal G K, Radio Engineering, Khanna Pub.

Reference Books:

1. Taub, H., Principles of Communication Systems, McGraw-Hill (2008) 3rd ed.
2. Haykin, S., Communication Systems, John Willey (2009) 4th ed
3. Kennedy, G., Electronic Communication Systems, McGraw-Hill (2008) 4th ed.

Note: Question paper template will be provided to the paper setter.

ECE-211N	Signals and Systems Lab					
Lecture	Tutorial	Practical	Practical	Sessional	Total	Time
0	0	3	60	40	100	3 Hr.
Course Outcomes						
CO1	To understand the basic concepts of MATLAB					
CO2	To explore properties of various types of signals and systems.					
CO3	To visualize the relationship between continuous and discrete fourier transforms.					
CO4	To understand the concept of sampling in time and frequency domain.					

List of Experiments:

1) To demonstrate some simple signal.

2) To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting).

3) To explore the various properties of the impulse signals.

4) To visualize the complex exponential signal and real sinusoids.

5) To identify a given system as linear or non-linear.

6) To explore the time variance and time invariance property of a given system.

7) To explore causality and non-causality property of a system.

8) To visualize the relationship between the continuous-time Fourier series and Fourier transform of a signal.

9) To visualize the relationship between the discrete-time Fourier series and Fourier transform of a signal.

10) To visualize the relationship between continuous-time and discrete-time Fourier transform of a signals.

11) To demonstrate the time domain sampling of bandlimited signals (Nyquist theorem).

12) To demonstrate the time domain sampling of non-bandlimited signals and antialiasing filter.

13) To demonstrate the signal reconstruction using zero-order hold and first-order hold filters.

14) To demonstrate the sampling in frequency domain (Discrete Fourier Transform).

15) To demonstrate the spectral analysis using Discrete Fourier Transform.

17) To demonstrate the convolution and correlation of two continuous-time signals.

18) To demonstrate the convolution and correlation of two discrete-time signals.

ECE-213N	Digital Electronics Lab					
Lecture	Tutorial	Practical	Practical	Sessional	Total	Time
0	0	3	60	40	100	3 Hr.

Course Outcomes	
CO1	To understand the concept of TTL gates such as AND, OR, NAND etc.
CO2	To study and verify various combinational circuits such as multiplexers, Comparators etc.
CO3	To understand the concept of sequential circuits such as flip flops, counters etc.
CO4	To design the state machine of four states and to study a sequence detector.

List of Experiments:

1. Study of TTL gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.

2. Design and realize a given function using K-Maps and verify its performance.

3. To verify the operation of Multiplexer and Demultiplexer.

4. To verify the operation of 2 bit Comparator using gates.

5. To verify the truth table of S-R, J-K, T, D Flip-flops.

6. To verify the operation of Bi-directional shift register.

7. To design and verify the operation of 3-bit asynchronous counter.

8. To design and verify the operation of asynchronous Up/down counter using J-K FFs.

9. Design a state machine of 4 states.

10. To design a sequence detector.

ECE-215N		**Analog Communications Lab**				
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
0	0	3	60	40	100	3 Hr.
Course Outcomes						
CO1	**To study various modulation techniques of Amplitude modulation and also demodulation.**					
CO2	**To study the generation techniques of SSB and DSBSC modulation**					
CO3	**To understand the concept of PLL , its capture range and frequency multiplier using PLL.**					

List of Experiments:

1. i) To study Double Sideband Amplitude Modulation and determine its modulation

    factor and power in sidebands.

    ii) To study amplitude demodulation by linear diode detector.

2. i) To study Frequency Modulation and determine its modulation factor.

    ii) To study PLL 565 as frequency demodulator

3. To study Sampling and reconstruction of pulse amplitude modulation system.

4. To study the Sensitivity characteristics of superhetrodyne receiver.

5. To study the Selectivity characteristics of superhetrodyne receiver.

6. To study the Fidelity characteristics of superhetrodyne receiver.

7. i) To study Pulse Amplitude Modulation

   a) Using switching method

   b) By sample and hold circuit.

ii) To demodulate the obtained PAM signal by IInd order Low pass filter.

8. To study Pulse Width Modulation / Demodulation.

9. To study Pulse Position Modulation / Demodulation.

10. To study active filters (Low-pass, High-pass, Band-pass, Notch filter).

MPC-201N	Environmental Studies (B.Tech. All Branches Semester –III/IV)					
Lecture	Tutorial	Practical	Theory	Sessional	Total	Time
3	0	0	75	25	100	3 Hrs.
Purpose	To learn the multidisciplinary nature, scope and importance of Environmental Studies					
Course Outcomes						
CO1	Basic concepts of Various kinds of Microscopy and Centrifugation Techniques					
CO2	To learn the theoretical and practical aspects of Electrophoresis and Chromatography Techniques					
CO3	To learn the concepts of different kinds of Spectroscopy and Colourimetry					
CO4	To understand the concept of radioisotope techniques and their applications in research					

UNIT 1

The multidisciplinary nature of environmental studies.Definition, Scope and Importance. Need for public awareness. Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems.

(a) Forest Resources: Use and over-exploitation, deforestation, case studies. Timber eztraction, mining, dams and their effects on forests and tribal people.
(b) Water Resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral Resources- Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) Food Resources- World Food Problems, changes caused by agriculture and overgazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) Energy Resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
(f) Land Resources- Land as a resource, land, degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyle.

UNIT II

Ecosystem-Concept of an ecosystem.Sturcture and function of an ecosystem.Producers, consumers and decomposers.Energy flow in the ecosystem.Ecological Succession.Food Chains, food webs and ecological pyramids. Introduction, types,characteristic features, structure and function of the following ecosystem-
a. Forest Ecosystem
b. Grassland Ecosystem
c. Desert Ecosystem
d. Aquatic Ecosystems(ponds, streams, lakes, rivers, oceans, esturaries

Field Work. Visit to a local area to document Environment assets- river/forest/grassland/hill/mountain.Visit to a local polluted site- Urban /Rural

Industrial/Agricultural.Study of common plants, insects and birds. Study of simple ecosystems-pond, river, hill, slopes etc. (Field work equal to 5 lecture hours).

UNIT III

Biodiversity and its conservation. Introduction, Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversityof global, National and local levels. India as a mega-diversity nation Hot spots of Biodiversity. Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts. Endangered and endemic species of India.Conservation of Biodiversity- In situ and Ex-Situ conservation of biodiversity.

Environmental Pollution Defiinitiom. Cause, effects and control measures of- (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution (e) Noise Pollution (f) Thermal Pollution (g) Nuclear Hazards
Solid waste management- cause, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides

UNIT IV

Social Issues and the Environment.From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people: Its problems and concerns. Case Studies.Environmental ethics-issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.Wasteland Reclamation.Consumerism and waste products.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. Human population and the Environment.Population growth, variation amomg nations. Population explosion-Family Welfare Programme. Envirommentsnd human health.Human rights.Value Education.HIV/AIDS, Women and Child Welfare.Role of Information Technology in Environment and Human Health.Case Studies.

Text Books

1. Environmental Studies- Deswal and Deswal. Dhanpat Rai & Co.
2. Environmental Science & Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India
3. Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
4. Environmental Science- Botkin and Keller. 2012. Wiley , India