

DEPARTMENT OF ENVIRONMENTAL SCIENCES

M. Sc., Environmental Science Course Structure (2 Years PG)



SYLLABUS - NEP-2020

Choice Based Credit System (CBCS)

2023-2024

SVU COLLEGE OF SCIENCES
CHOICE BASED CREDIT SYSTEM (CBCS) (AS PER NEP-2020)
The course of Study and Scheme of Examinations (w.e.f. 2023-24)
M. Sc., ENVIRONMENTAL SCIENCES (2 Years PG)

SEMESTER - I

| S. N | Course Code | Components of Study | Title of the Paper | Contact hours | No. of Credits | I A Marks | End SEM Exam Marks | Total |
|--------------|-------------|-----------------------|--|---------------|----------------|-----------|--------------------|------------|
| 1 | ENV 101 | Core- Theory | Ecology and Environment | 6 | 4 | 20 | 80 | 100 |
| 2 | ENV 102 | Core- Theory | Environmental Chemistry | 6 | 4 | 20 | 80 | 100 |
| 3 | ENV 103 | Compulsory Foundation | A. Environmental Toxicology and Public Health B. Occupational Health and Industrial Safety | 6 | 4 | 20 | 80 | 100 |
| 4 | ENV 104 | Elective Foundation | A. Biodiversity Conservation and Management B. Environmental Management and Sustainable Development | 6 | 4 | 20 | 80 | 100 |
| 5 | ENV 105 | Practical -I | Paper 1 & 3 | 6 | 4 | - | - | 100 |
| 6 | ENV 106 | Practical -II | Paper 2 & 4 | 6 | 4 | - | - | 100 |
| 7 | ENV 107 | Audit Course | Human Values and Professional Ethics-I | - | - | 100 | - | - |
| Total | | | | 36 | 24 | - | - | 600 |

SEMESTER-II

| S.N | Course Code | Components of Study | Title of the Paper | Contact hours | No. of Credits | I A Marks | End SEM Exam Marks | Total |
|--------------|-------------|-----------------------|---|---------------|----------------|-----------|--------------------|------------|
| 1 | ENV 201 | Core- Theory | Energy and Environment | 6 | 4 | 20 | 80 | 100 |
| 2 | ENV 202 | Core- Theory | Environmental Pollution | 6 | 4 | 20 | 80 | 100 |
| 3 | ENV 203 | Compulsory Foundation | A. Instrumental Techniques and Applications B. Environmental Geology | 6 | 4 | 20 | 80 | 100 |
| 4 | ENV 204 | Elective Foundation | A. Environmental Laws, Policies and Legislation B. Soil Biology | 6 | 4 | 20 | 80 | 100 |
| 5 | ENV 205 | Practical -I | Paper 1 & 3 | 6 | 4 | - | - | 100 |
| 6 | ENV 206 | Practical -II | Paper 2 & 4 | 6 | 4 | - | - | 100 |
| 7 | ENV 207 | Audit Course | Human Values and Professional Ethics-II | - | - | 100 | - | - |
| Total | | | | 36 | 24 | | | 600 |

SEMESTER-III

| S.No | Course Code | Components of Study | Title of the Paper | Contact hours | No. of Credits | I A Marks | End SEM Exam Marks | Total |
|------|-------------|------------------------------|--|---------------|----------------|-----------|--------------------|------------|
| 1 | ENV 301 | Core- Theory | Waste Treatment and Management | 6 | 4 | 20 | 80 | 100 |
| 2 | ENV 302 | Core- Theory | Environmental Impact Assessment, Audit And Economics | 6 | 4 | 20 | 80 | 100 |
| 3 | ENV 303 | Generic Elective | A. Statistics, Computer Applications and Modeling B. Ecotourism and Eco-restoration | 6 | 4 | 20 | 80 | 100 |
| 4 | ENV 304 | Practical's | Core & Generic | 6 | 4 | 20 | 80 | 100 |
| 5 | ENV 305 | Skill Oriented Course | Computer Applications and Toxicological Study in Food Adulteration + Practicals | 3 | 4 | 10 | 40 + 50 | 100 |
| 6 | ENV 306 | Open Elective | A. Natural Resources Conservation B. Environmental Education | 6 | 4 | 20 | 80 | 100 |
| | | Total | | 36 | 24 | | | 600 |

SEMESTER-IV

| S.N | Course Code | Components of Study | Title of the Paper | Contact hours | No. of Credits | I A Marks | End SEM Exam Marks | Total |
|-----|-------------|---------------------------|--|---------------|----------------|-----------|--------------------|------------|
| 1 | ENV 401 | Core- Theory | Water Resources and Watershed Management | 6 | 4 | 20 | 80 | 100 |
| 2 | ENV 402 | Core- Theory | Remote Sensing and GIS | 6 | 4 | 20 | 80 | 100 |
| 3 | ENV 403 | Generic Elective | A. Environmental Safety B. Disaster Mitigation and Management | 6 | 4 | 20 | 80 | 100 |
| 4 | ENV 404 | Practical's | Core & Generic | 6 | 4 | - | - | 100 |
| 5 | ENV 405 | Multi-Disciplinary course | Project Work + Comprehensive Viva-Voce | 6 | 4 | - | - | 100 |
| 6 | ENV 406 | Open Elective | A. Forest Resources and Management B. Global Environmental Issues | 6 | 4 | 20 | 80 | 100 |
| | | Total | | 36 | 24 | - | - | 600 |

SEMESTER – I

ENV 101::ECOLOGY AND ENVIRONMENT

UNIT-I

Ecology and Environment: Scope – Ecological Principles- Structure and Functions of Ecology- Ecological Factors-Environmental Science as interdisciplinary Subject – Earth, Man and Environment Relationship – Importance of biological cycles in the environment

UNIT-II

Population and Community Ecology: Population density- Population fluctuations-Population dynamics – Impact on Environment – Human population – Effect on Environment – Growth and factors affecting change in size of human population – Family Planning Methods, birth control, socio-economic methods of controlling population growth- Seed Germination and Reproductive capacity
Different communities and their occupation in different ranges in the environment and their relationship for the maintenance of eco-balance in the environment

UNIT – III

Ecosystem – Definition – Components – Structure – Types – Functions – Interrelationship of different ecosystems – Food chain – Food web – Productivity – Ecological energetics – Energy flow in the ecosystem- Ecological efficiency-Ecological Concepts of the Species- Habitat and Niche, ecological succession.

UNIT – IV

Soil Nutrients – Soil profile – Soil texture – Soil classification– Soil organic matter –Soil microbes– Biogeochemical cycles (C, N, P, K) – Ecological aspects and their importance for maintenance of eco-balance – Food production and future human existence in the environment – Eco-friendly programmes.

REFERENCES:

1. Odum E.P., **Fundamentals of Ecology**, WB Saunders Co., London (1971).
2. Sharma P.D., **Ecology and Environment**, Rastogi Publications, Meerut (1994).
3. Oliver S Owen, **Natural Resources Conservation – An Ecological Approach**, acmillan Publishing Co. Inc., New York (1980).
4. Daniel D Chiras, **Environmental Science**, the Benjamin/Cummings Publishing Co. Inc (1994).
5. Singh H.R., **Introduction to Animal and Environmental Biology**, Vishal Publications (1989).
6. Robert H Giler, **Wildlife Management**, W.H. Freeman and Company, San Francisco (1978).
7. Raymond F Dasmann, **Environmental Conservation**, John Wiley & Sons (1984).
8. N.S. Subrahmanyam, A.V.S.S Sambamurty, **Ecology**, Narosa Publishing House, New Delhi.

ENV 102::ENVIRONMENTAL CHEMISTRY

UNIT – I

Atmospheric Chemistry: Chemical reactions in the atmosphere – Aerosol types, production and distribution – Aerosols and radiation – Atmospheric turbidity and related environmental problems - Inversions – Global climate and photochemical reactions – Global warming – Greenhouse effect – Ozone depletion – Acid rain – Corrosion mechanism – Prevention – Particles in Atmosphere – Composition sources – Types and effects.

UNIT – II

Toxicological Chemistry: Introduction to toxicology and toxicological Chemistry – Toxicants – Dose-Response Relationships – Reactions of acids and bases on surfaces - Toxic chemicals in the environment – Biochemical aspects of As, Cd, Pb, Hg, CO, O₃, PAN, Pesticides, MIC and carcinogens in air.

Biotransformation of Xenobiotics: Principles – Receptor sites – absorption and storage of xenobiotics – types of biotransformations – Microsomal oxidations – Mixed function oxygenases – conjugation – biotransformation of organochlorine and organophosphorous pesticides – Antidotal procedures in Toxicology.

UNIT – III

Soil Chemistry: Micro and Macronutrients – Inorganic and Organic contaminants in the soil – Biodegradation – Nondegradable waste and its effect on the environment –Bioremediation of surface soils – Fate and Transports of contaminants in the Vadose zone – Bioindicators – Soil parameters – Soil destruction – Erosion – Soil conservation.

UNIT – IV

Water Chemistry: Water pollutants – Types – Sources – Heavy metals – Metalloids – Organic, Inorganic, Biological and Radioactive – Types of reactions in various water bodies including marine environment – Eutrophication – Ground water – Potable water.

Green Chemistry: Introduction – Inception and Evolution – Importance of solvents – Types of catalysts and their role – Biological alternatives – Applications.

REFERENCES::

1. Sharma, B.K. Kaur H., **Environmental Chemistry**, Goel Publishing House (1995).
2. Tyagi O.D. and Mehra M, **Text Book of Environmental Chemistry**, Anmol Publications (1990).
3. Johnson D.O., Nettekville J.T., Wood J.C. and James M, **Chemistry and the Environment**, W.B.Saunders Company Philadelphia (1972).
4. Bailey R.A., Clerke H.M., Ferris J.P., Krause S and Strong R.L., **Chemistry of the Environment**, Academic Press., New York (1978).
5. Stanley E Manahan, **Environmental Chemistry**, Lewis Publishers (2001).
6. Thomas G Spiro and William M Stigliani, **Chemistry of the Environment**, Prentice Hall of India (2004).
7. RashmiSanghi and Srivastava M.M., **Green Chemistry**, Narosa (2006).

ENV 103 (A):: ENVIRONMENTAL TOXICOLOGY AND PUBLIC HEALTH

(Compulsory Foundation)

UNIT - I

Environmental Degradation: Man and Environment – Man made Degradation – Deforestation – Urbanization – Industrialization – Mining – Dam building and other activities.

UNIT – II

Environmental Toxicology: Introduction of Toxicology – History and Types of Toxicology – Toxicity (LD⁵⁰ and LC⁵⁰) – Hazards – Risk Benefits – Risk ratio to tolerance limits – Acceptable daily intake – Threshold Value – Pesticide Toxicology – Detoxification – Resistance and Metabolism – Pesticide – Pesticide Classification – Pest Surveillance – Pest resistance - Residue and Effect – Heavy Metal Toxicology – Toxicology of some Hydrocarbons – Industrial Toxicology and Risk Assessment.

UNIT – III

Environmental Epidemiology: Role of Epidemiological Study in evaluation of Environmental Hazards – Occupational Environmental and Health Hazards – Community Environment and Health Hazards – Microbial, Algal, Invertebrate and Alternative Toxicity Tests – Epidemiological Episodes.

UNIT - IV

Health and environmental impacts of Nanotechnology :

Engineered Nanomaterials of Relevance to Human Health – Engineered Nanomaterials in the Body – Routes of Entry – Toxicological Health Effects Caused by Nanoparticles – Relevant Parameters in Nanoparticle Toxicology – Integrated Concept of Risk Assessment of Nanoparticles – Plant and Microbes as Nanofactories.

Public Health: Public Health Programmes – Objectives and Scope – Urban and rural Health – Sanitation – Malarial Control Measures – HIV/AIDS – Domestic and Residential Waste Disposal Studies.

REFERENCES:

1. Sharma.P.D.,**Environmental Biology and Toxicology**, Rastogy (1994).
2. MeeraAsthana and Asthana.D.K.,**Environmental Pollution And Toxicology**,Alka Printers (1994).
3. Guithinier Perry, **Introduction to Environmental Toxicology**, Elsevier Publications (1980).
4. Oehme W.F., **Toxicity of Heavy Metals in Environment**, Marcel Dakkar Inc., New York (1989).
5. Lave L.B. and Upton A.C., **Toxic Chemicals, Health and the Environment**, John Hopkins University Press, Baltimore and London (1987).
6. Beyar W.N., Heing H.G. and Norwood A.W.R., **Environmental Contaminants in Wild Life**, CRC Lewis Publishers, New York (1996).
7. Dikshit T.S.S., **Toxicology of Pesticide in Animals**, CRS Press Inc., Boca Raton, Florida, USA (1991).
8. SubbiahBalji**Nanobiotechnology**, MJP Publishers, Chennai(2010).
(P.No.181 – 207).
9. Dr.U.Kumar, **NanoTehonology: Fundamental approach**, AgroBios, Jodhpur. (P.No.216 - 225)

ENV-103 (B): OCCUPATIONAL HEALTH AND INDUSTRIAL SAFETY

(Compulsory Foundation)

UNIT I: Occupational Health

Hazards and Safety—Physical, Chemical and Biological hazards. Occupational Diseases and Occupationally induced illness - Prevention and Control. Health problems in different types of industries. Measures for Workers. Health Education Medical First- Aid and Management of Medical Emergencies. Epidemiological approaches. Ergonomics.

UNIT II: Industrial Safety Management Techniques

Industrial Safety Standards. Dispersion of Radioactive material and release of Toxic and inflammable materials. Work Study – Method of Study and Measurement. Measurement of Skills. Safety - Cost of Expenses. Principles and Functions in Safety Management.

UNIT III: Hazards Exposure evaluation

Sampling techniques, Personal monitoring, Biological monitoring; Threshold Limit Values (TLV), STEL; List of Industries involving Hazardous process Occupational Hazards under the First Schedule of the Factories Act,1948; Permissible Limits of certain Chemical substances in work environment under the Second Schedule of the Factories Act,1948.

UNIT IV: Hazards Control

Causes of Accident – Theory of accidents, Accident Reporting system, Safety Audit, Accident prevention, Safety Committee, Case studies on Bhopal, Chernobyl and similar disasters - Control of Hazards Substitutions, Isolation, Personal Protective Equipment (PPE).

REFERENCES

1. A B C of Industrial Safety, Walsh, W and Russell, L, (1984), Pitma Publishing United Kingdom.
2. Della D.E., and Giustina, 1990, DzSafety and Environmental Managementdz, Van NostrandReinhold International Thomson Publishing Inc.
3. Environmental and Industrial Safety, Hommadi, A. H. (1989), I.B.B Publication, New Delhi.
4. Environmental Strategies—Hand Book, Kolluru R. V, (1994) McGraw Hill Inc., New York.
5. Goetsch D.L.,1990, Occupational Safety and Health for Technologists, Engineers andManagersdz, Prentice Hall.

ENV-104 (A) ::BIODIVERSITY CONSERVATION AND MANAGEMENT

(Elective Foundation)

UNIT – I

Biodiversity: Definition and concept – Distribution of climatic regions of world and vegetation types – Patterns of species diversity – Species importance – Species area relationships – Theories of species diversity – Equilibrium theory – Biodiversity of tropical and temperate regions – Hot Spots of the world – Case Studies on Forests, Deserts, Coral Reef and Island Species.

UNIT – II

Measures of Biodiversity: Alfa, Beta and Gamma diversities – Indices of diversity and evenness – The Simpson Index Diversity of fully censured communities – Estimating the diversity of large community – Evenness and Equitability – Hierarchical diversity.

UNIT – III

Conservation and Management of Biodiversity: Types of conservation – In-situ and Ex-situ conservation – Concept of germ plasma preservation and gene banks – Community Biodiversity – Registers and their importance – National Biodiversity Strategy and Action Plan Programme – Protected Area Management Plan – Biodiversity Bill 2002 – Patent Act Agenda 21 – National Policies and Acts [Wild Life (Protection) Act,1972] related to biodiversity.

UNIT – IV

Environment and Biotechnology: Microbes in relation to environment – Biosensors – Environmental applications of biosensors – Biotechnological methods in pollution abatement – Biodegradation – Genetically Engineered Microbes (GEMs) in biotreatment of wastes – Eco-friendly bio-products for environmental health – Environmental biotechnology in the 21st century.

REFERENCES:

1. Mac Arthur R.H., **Geographical Ecology: Patterns in the Distribution of Species**, Harper & Row Publications, New York (1972).
2. Pielou E.C., **Ecological Diversity**, John Wiley & Sons, New York (1975).
3. Stracey P.D., **Wild Life in India – Its Conservation and Control**, Ministry of Food And Agriculture, Govt. of India, New Delhi (1963).
4. Saharia V.B., **Wild Life in India**,Nataraj Publishers, Dehradun (1982).
5. Seshadri B, **Indian Wild Life Resources**, Sterling Publishers, New Delhi (1982).
6. Chatterji, A.K., **Introduction to Environmental Biotechnology**, Prentice Hall, New Delhi (2005).

ENV 104 (B):: ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT(Elective Foundation)

UNIT-I: Environmental Management

Implementation of Environmental Management System-EMS definition Environment Policy and components of EMS-Identification of environmental aspects and impacts

UNIT II: Management tools

Implications of Environmental Management tools for Environmental Management-Environmental legislations, institutions and policies with special reference to India-Policy responses to environmental degradation.

UNIT-II: Management requirements

Legal and other requirements-Training and awareness requirements- Application of Environmental Standards- ISO standards and history of their development.

UNIT IV: Sustainable Development

Concept of sustainable development- key principles - poverty and sustainable development Environmental management - innovation strategies for sustainable development - Governance for sustainable development.

REFERENCES:

1. Cunningham W and Cunningham M.A., **Principles of Environmental Science**, McGraw Hill, London (2003).
2. Joseph K and Nagendran R, **Essentials of Environmental Studies**, Pearson Education, Delhi (2004).
3. Agarwal K.M., Sikdar P.K. and Deb S.C., **A Text Book of Environment**, Mac Millan India Ltd, Kolkatta (2002).
4. Tyler Miller Jr. G, **Living in the Environment – Principles, Connections and Solutions**, Wadsworth Publishing Co., New York (1996).
5. Wright R.T. and Nebel B.J., **Environmental Science – Towards Sustainable Future**, Prentice Hall, New Delhi (2002).

ENV105:: PRACTICAL – I

1. Estimation of effective population size.
2. Estimation of Species Diversity.
3. Estimation of a primary production in a water body.
4. Estimation of dust accumulated on plant parts and its effects on morphology and anatomy of plants.
5. Estimation of protein content of biological samples.
6. Determination of total carbohydrates in biological system.
7. Estimation of trace heavy metals in soil, plant and animal material.
8. Estimation of sulphates, phosphates, nitrates and chlorides in water sample.

ENV106:: PRACTICAL – II

1. Determination of chromium and zinc by Spectrophotometry.
2. Multi element analysis by AAS.
3. Analysis of mercury by mercury analyzer.
4. Application of Fluorimetry.
5. Estimation of Na, K, Ca, Mg by Flame Photometry.
6. Determination of soil type and texture, pH, Hydraulic conductivity, Soil moisture, Nitrogen, Potassium, Phosphorous and Organic matter.
7. Determination of Fe⁺²/Cr⁺⁶ in soil sample.

ENV 107 :: HUMAN VALUES AND PROFESSIONAL ETHICS-I

UNIT –I:

Definition and Nature of Ethics – Its relation to Religion, Politics, Business, Legal, Medical and Environment. Need and Importance of Professional Ethics – Goals – Ethical Values in various Professions.

UNIT – II:

Nature of Values- Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values, Analysis of basic moral concepts- right, ought, duty, obligation, justice, responsibility and freedom. Good behavior and respect for elders.

UNIT – III:

Ahimsa (Non-Violence), Satya (Truth), Brahmacharya (Celibacy), Asteya(Non-possession) and Aparigraha (Non-stealing). Purusharthas (Cardinal virtues)- Dharma (Righteousness), Artha (Wealth), Kama(Fulfilment Bodily Desires). Moksha (Liberation).

UNIT – IV:

Bhagavad Gita-(a) Niskama karma. (b) Buddhism- The Four Noble Truths – Arya Astangamarga, (C) Jainism – mahavratas and anuvratas. Values Embedded in Various Religions, Religious Tolerance, Gandhian Ethics.

UNIT – V:

Crime and Theories of punishment- (a) Reformative, Retributive and Deterrent . (b)Views on manu and Yajnavalkya.

REFERENCES:

1. R.Subramanian, Professional Ethics, Oxford University Press
2. John S Mackenjie: A Manual of ethics.
3. The Ethics of Management” by Larue Tone Hosmer. Richard D.Irwin Inc.
4. “Management Ethics” integrity at work’ by Joseph A. Petrick and John F. Quinn. Response Books: New Delhi.
5. “Ethics in Management” by S.A. Sherlekar, Himalaya Publishing House.
6. Harold H. Titus: Ethics for Today.

SEMESTER – II

ENV 201::ENERGY AND ENVIRONMENT

UNIT – I

Basic Concepts of Energy: Energy – Definition – Forms of energy – Potential, Kinetic, Mechanical, Thermal, Electrical, Chemical and Nuclear Energy – Uses of energy – Energy Sources – Conventional and Non-conventional energy sources.

Conventional Energy Sources: Firewood – Coal – Origin and development of coal – Coal reserves in India and World – Clean coal combustion – Petroleum and Natural Gas – Composition and Classification of Petroleum – Reserves of Petroleum and Natural Gas in India and the World – Hydroelectric Power – Thermal Power – Synthetic Fuels – Consumption and management of conventional energy sources.

UNIT - II

Alternate energy Sources: Need for alternate energy sources – Renewable energy sources.

Solar Energy: Importance – Collection of Thermal Energy – Flat Plate Collector – Solar Air Collector – Solar Concentrators – Thermal Energy Storage – Non-convective Solar Pond – Photovoltaic Systems.

UNIT – III

Wind Energy: Wind Energy Conversion System – Operational Characteristics – Applications of Wind Energy.

Geothermal Energy: Basics of Geological Process – Geothermal Resources – Utilization.

Ocean Tidal and Wave Energy: Introduction – Energy Conversion Systems.

Bioenergy: Biomass, Biofuels and Biogas – Origin of Biomass – Biomass Sources – Biofuel Production Process – Gasification – Biogas.

Nuclear Energy: Need and importance – Sources of nuclear energy – Nuclear fission reactions – Fission Power – Fusion Power.

UNIT – IV

Environmental Effects associated with Energy Sources and Energy Planning: Energy Consumption in India and different parts of the World – Environmental Impact of large scale exploitation of solar, wind, hydro and ocean energy – Energy Planning and Legislation – Future Energy Options – Indo-US Nuclear Agreement.

REFERENCES::

1. Tiwari G.N. and Ghosal M.K., **Renewable Energy Resources**, Narosa (2005).
2. Rai G.D., **Non-conventional Energy Sources**, Khanna Publishers (2001).
3. Desai A.V., **Bio energy**, Wiley Eastern Limited, International Development Research Center, Ottawa, Canada.
4. Trivedi R.P. and Gurudeep Raj, **Encyclopedia of Environmental Sciences – Environmental Energy Resources**.
5. Sukhatme S.P., **Solar Energy**, Tata McGraw Hill, New Delhi (1996).

ENV- 202:: ENVIRONMENTAL POLLUTION

UNIT – I

Atmospheric Pollution: Sampling and analysis of SO₂, NO_x, NO₂, CO₂, fluoride, hydrocarbons and particulates – Cryogenic sampling – Impinges – Scrubbers – Adsorption – Absorption for analysis of SO₂, NO₂, CO₂, fluoride and hydrocarbons – Automobile emissions – Types and their control methods – Auto cyclic engines – Gaseous pollutant monitoring – Particulate – Ringleman Scale – Dosimetry – High volume samples – Analysis and control of particulate matter.

Indoor Air Pollution: Sources – Classification – Respirable particulates – Radon and biological contaminants – Analysis and design.

UNIT – II

Water Pollution: Sampling, analysis and prevention – Determination of pH, DO, BOD, COD, Solids, colour, turbidity, various forms nitrogen, phosphates, fluorides, sulphates, hardness, heavy metals, oil and grease, phenols, pesticides and radio nuclides.

UNIT – III

Soil Pollution: Sampling, analysis and prevention – Determination of pH – Cation exchange capacity of macro and micronutrients in soil systems.

Marine Pollution: Marine – Material addition – Natural and Anthropogenic activity – Oil pollution and effects on marine organisms – Control methods.

UNIT – IV

Noise Pollution: Sources – Noise indices – Classification of Noise loads – Effect of noise on biota and human health – Control and prevention methods.

Radioactive Pollution: Sources of Pollution – Effect of radiation on environment – Safe disposal of radioactive waste – Radiation protection and control measures – Biological dosimetry.

Thermal Pollution: Sources – Various chemical and biological reactions of water – Prevention and Control of thermal pollution.

REFERENCES:

1. Henry C Perkins, **Air Pollution**, McGraw-Hill (1974).
2. Chhatwal G.R, Mehra M.O., Katyal T, Satake K Mohan Katyal and Nagahiro T, **Environmental Noise Pollution and its Control**, Anmol Publications (1989).
3. Trivedy R.K. and Goel P.K., **An Introduction to Air Pollution**, Techno Science Publications, Jaipur (1995).
4. Kudesia V.P., **Water Pollution**, PragatiPrakashan Publications (1985).
5. Sharma P.D., **Environmental Biology**, Rastogi and Co (1995).
6. Harrison, R.M., **Pollution – Causes, Effects and Control**, Royal Society of Chemistry (1990).
7. Handbook of Nanofabrication. Edited by Gary W iederrcht.Elsevier, 2010.
8. Introduction to Nanoscience by Gabor L. Hornyak, Joydeep Dutta, Harry F. Tibbals, Anil K. Rao. CRC Press, 2008.

ENV- 203 (A): INSTRUMENTAL TECHNIQUES AND APPLICATIONS

(Compulsory Foundation)

UNIT – I

Spectroscopic Techniques: Basic principles – Beer-Lambert's Law – Salient features – Instrumentation and applications of UV-VIS Spectrophotometry – Colorimetry – Flame Photometry – Fluorimetry – Types of spectrophotometers – Use of spectroscopic techniques for trace metal analysis in environmental samples.

UNIT – II

Atomic Absorption and Emission Spectroscopy: Fundamentals of Atomic Emission and Atomic Absorption – Flame Atomic and Emission Spectroscopy – Atomic Absorption Spectrophotometer (AAS) – Principle and Instrumentation – Graphite Furnace – Flow Injection Technique – Inductively Coupled Plasma Emission Spectroscopy (ICPES) – Comparison of AAS and ICPES – Application of the AAS and ICPES for the determination of trace metals.

UNIT – III

Chromatographic Techniques: Basic principles – Paper Chromatography – Thin Layer Chromatography – Ion Exchange Chromatography – Higher Performance Liquid Chromatography – Gas Chromatography – Instrumentation and applications.

UNIT – IV

Radiochemical Techniques: Radioactivity – Carbon dating – Radioactive labeling – Tracer applications: Isotope Dilution, Neutron Activation Analysis – Radiometric Titration.

Nanomaterials for Environmental Protection: Nano technology processes – Nano Engineering materials for Pollution Prevention, Energy efficient resources and materials, Nano technology products- Nanomaterials, Nano devices and nanosystems

REFERENCES::

1. Willard, Merritt, Dean and Settle, **Instrumental Methods of Analysis**, CBS Publishers, New Delhi (1986).
2. Gurudeep R Chatwal and Sham K Anand, **Instrumental Methods of Chemical Analysis**, Himalaya (2005).
3. Vogel, **Text Book of Quantitative Inorganic Analysis**, Longmann Scientific and Technical, UK (1991).
4. Sharma B.K., **Instrumental Methods of Chemical Analysis**, Goel (2001).
5. **Standard Methods for the Examination of Water and Waste Water**, APHA, Washington (1998).
6. Murugesan and Rajakumari, **Environmental Science and Biotechnology – Theory and Practice**, MJP Publishers, New Delhi (2005)
7. Mao Hong fan, Chin pao Huang, Alan E Bland, Z Honglin Wang, RachidSliman, Ian Wright, **Environanotechnology**, Elsevier,(2010)
8. Jo Anne Shatkin, **Nanotechnology: Health and Environmental risk** , CRC press,(2008)

ENV-203 (B)::ENVIRONMENTAL GEOLOGY
(Compulsory Foundation)

UNIT – I

Earth processes, Geological cycle, Tectonic cycle, Rock cycle, Hydrological cycle, Biogeochemical cycles, Special problems of time and scale in geology, concept of residence time and rates of natural cycles.

UNIT – II

Catastrophic geological hazards, Prediction and perception of the hazards and adjustment to hazardous activities.

UNIT – III

River flooding- causes, nature and frequency of floods. Landslides- causes, intensity and magnitude. Volcanism nature extent and causes, Volcanism and climate. Avalanches causes and effects.

UNIT – IV

Mineral and human use, geology of mineral resources, EIA of mineral development, recycling of mineral resources.

References

1. Environmental geology- Edward A. Keller
2. Physical geology - C.W. Montgomery.
3. Geology of India - National book trust series.

ENV-204 (A):: ENVIRONMENTAL LAWS, POLICIES AND LEGISLATION

(Elective Foundation)

UNIT – I

Environmental Protection: Need – Issues - Problems and Awareness – International and National Efforts for Environmental Protection – Agenda 21- Environmental Ethics and Global Imperatives – Current Environmental Issues in India – Constitutional Amendments – Article 48 A & 52 A.

UNIT – II

Environmental Legislation: Scope and importance – Key concept of environmental management and approaches – Environmental legislation and punitive control – Objectives of legislation and frame work in the country – Planning and enforcement – Environmental Organizations – Information exchange and surveillance – EIA Notification in 1994 – ISO 14000 – EMS Standards.

UNIT – III

Environmental Policy in India: Need for policies- Public Policy – Economic policies – Relationship between economic development and environment – Implementing Environmental Public Policy Strategies in pollution control – Constitutional provisions in India regarding environment – Public Awareness and Participation in Environmental Management – National Land Use Policy 1988 – Industrial Policy 1991.

UNIT– IV

Environmental Laws and Acts: Environmental Laws – Need – Indian Prospective – National Committee on Environmental Planning (NCEP) – Role of Indian Judiciary in the protection of Environment : Forest Conservation Act, 1980, Indian Forest Act (Revised) 1982, Wild Life Protection Act, 1972 amended 1991, Air (Prevention and Control of pollution) Act 1981 amended 1987, The Water (Prevention and control of pollution) Act 1988, Motor Vehicle Act 1988, Hazardous Waste Management Act 1989, Biomedical Waste Act 1999, Plastic Act 2000 – Municipal solid waste Act 1999, Public Liability Insurance Act 1992 - Biodiversity and WTO (1988) – Convention on biological diversity (1992) – Ecological, Economic, Aesthetic and other importance of Biological diversity.

REFERENCES::

1. Trivedi R.K., **Handbook of Environmental Laws, Guidelines, Compliances and Standards, Vol I and II**, B.S. Publications.
2. Newson M.M., **Managing the Human Impact on the Natural Environment: Patterns and Processes**, International Book Distributor, Dehradun (1993).
3. Keith Thomas, **Man and Natural World – A History of Modern Sensibility**, Pantheon, New York (1983).
4. Jadav H and Bhosale V.M., **Environmental Protection and Laws**, Himalaya Publications (1995).
5. Shyam Divan and Armin Rosencranz, **Environmental Law and Policy in India**, Oxford Uni. Press (2001).

ENV- 204 (B) :: SOIL BIOLOGY(Elective Foundation)

UNIT-I

Soil genesis and provenance, pedosphere, Soil organic matter: sources, composition, microbial decomposition of organic matter, Humus formation Taxonomy and biology of soil organisms. Position and role of soil fauna in soil, ecological niche. Economic importance of soil microbes.

UNIT-II

Role of soil biota in ecological interactions such as biological invasions, allelopathy or plant-soilfeedbacks. Effects of soil-driven unrgulates on plant communities.

UNIT-III

Root exudates: fate of plant allelochemicals in soil. Effect of root exudates on soil biota, and its role on plant growth.Role of soil biota in nutrient cycles such as carbon, nitrogen, sulphur, phosphorus.

UNIT-IV

Soil mutualistic associations: mycorrhizal (arbuscular, ecto- and ercoid) symbioses, role ofmycorrhizae in biological invasion, nitrogen fixing symbioses.Environmental problems related to soils in India: desertification, salinization, and erosion.Brief account of bioremediation of contaminated soils and ground water, soil composting.

References

1. Alexander, M. 1977. Introduction to Soil Microbiology (2ndEdn.) Wiley John.
2. Alexander, M. 1994. Biodegradation and Bioremediation, Academic Press.
3. Anderson, J.M. and Ingram, J.S.I. eds. 1989. Tropical Soil Biology and Fertility (p. 171). Wallingford:CAB international

ENV 205:: PRACTICAL – I

1. Determination of pH, Dissolved solids and suspended solids, Dissolved Oxygen, COD, BOD, Alkalinity/Acidity and hardness.
2. Production of biogas in laboratory.
3. Photovoltaic applications of solar cell.
4. Determination of the amount of pesticide/insecticide in water/vegetable samples.
5. Estimation of biochemical toxicity by AAS.
6. Estimation of the amount of NO₂ in photochemical smog samples.

ENV 206:: PRACTICAL – II

1. Estimation of the amount of LC₅₀ of Pb in organisms.
2. Vegetation analysis: Frequency, Abundance and Density, Cover and Basal area, Important Value Index.
3. Vegetation sampling: Transects, Plot less methods.
4. Community coefficients.
5. Diversity measures: Shannon Wiener, Simpson and Brillion's Index.
6. Diversity measures of Birds fauna in different habitat conditions.

ENV 207:: HUMAN VALUES AND PROFESSIONAL ETHICS – II

UNIT – I:

Value Education- Definition – relevance to present day – Concept of Human Values – Self introspection – Self-esteem – Family values-Components, structure and responsibilities of family- Neutralization of anger – Adjustability – Threats of family life – Status of women in family and society – Caring for needy and elderly – Time allotment for sharing ideas and concerns.

UNIT – II:

Medical ethics- Views of Charaka, Sushruta and Hippocrates on moral responsibility of medical practitioners. Code of ethics for medical and healthcare professionals. Euthanasia, Ethical issues in relation to health care professionals and patients. Social justice in health care, human cloning, problems of abortion. Ethical issues in genetics engineering and Ethical issues raised by new biological technology or knowledge.

UNIT – III:

Business ethics- Ethical standards of business- Immoral and illegal practices and their solutions. Characteristics of ethical problems in management, ethical theories, causes of unethical behavior, ethical abuses and work ethics.

UNIT – IV:

Environmental ethics- Ethical theory, man and nature- Ecological crisis, Pest control, Pollution and waste, Climate change, Energy and population, Justice and environmental health.

UNIT – V:

Social ethics- Organ trade. Human trafficking. Human Rights violation and social disparities, Feminist ethics. Surrogacy/Pregnancy. Ethics of media- Impact of Newspapers, Television, Movies and Internet.

REFERENCES:

1. John S Mackenjie: A manual of ethics
2. “The Ethics of Management” by Larue Tone Hosmer. Richard D. Irwin Inc.
3. “Management Ethics” integrity at work’ by Joseph A. Petrick and John F. Quinn Response Books: New Delhi.
4. “Ethics in Management” by S.A. Sherlekar, Himalaya Publishing House.
5. Harold H. Titus: Ethics for Today
6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manava Dharma Sastra or the Institute of Manu: Comprising the Indian System of Duties: Religious and Civil (ed.) G.C.Halighton.
10. SusrptaSamhita:Tr.KavirajKunjanlal, KunjanlalBrishagratha. Chowkarnba Sanskrit series. Vol LII and III, Varanasi, Vol I 00, 16, 20, 21 – 32 and 74 – 77 only.
11. CharakaSamhita: Tr. Dr. Ram Karan Sarma and Vaidya Bhagavan Dash, Chowkambha Sanskrit Series office. Varanasi I, II, III Vol IPP 183-191.
12. Ethics, Theory and Contemporary Issues. Barbara Mackinnon Wadsworth/Thomson Learning, 2001.
13. Analyzing Moral. Issues, Judith A. Boss. May Field Publishing Company – 1999.
14. An Introduction to Applied Ethics (Ed.) John H.Piet and Ayodhya Prasad. Cosmo Publications.
15. Text Book for Intermediate First Year Ethics and Human Values. Board of Intermediate Education- Telugu – Academi, Hyderabad.
16. I.C Sharma Ethical Philosophy of India. Nagin& co Julundhar.

SEMESTER – III

ENV- 301:: WASTE TREATMENT AND MANAGEMENT

UNIT – I

Water Treatment: Different sources of water – Methods of water purification – Flocculation, Sedimentation, Sedimentation with coagulation – Jar Test – mixing basins – Clarifiers – Filtration – Types of filtration – Disinfections of water – Industrial Waste water Treatment – Tannery, Distillery, Sugar mill, Paper mill and Pulp Industry – study of effluent treatment plants.- Miscellaneous methods, Desalination, Membrane techniques – Reclamation and reuse of industrial and domestic waste water – Rain water harvesting.

UNIT – II

Sewage Treatment and Disposal: Self purifications of streams – BOD and its importance – Treatment methods – Primary, Secondary and tertiary levels – Disinfections of treated sewage effluent – Septic tank design and effluent disposal methods – Disposal on land, Sewage sickness – Disposal by dilution – Design of biological treatment units – Sludge characteristics, unit operation in sludge disposal, conventional and high rate digester – Disposal of sludge – Gas utilization.

UNIT – III

Solid Waste Management:Sources and generation of solid waste – characterization, chemical composition and classification – Dumping of garbage – Commercial, Industrial Agriculture, Mining and Power Plant discharges – Disposal Methods – Composting, incineration and others – Biomedical waste management.

Hazardous Waste Management:Cyanides, Dioxins, detergents, plastics, nylon, PCB's and others – Waste minimization methods – Monitoring and management strategies – Chemical and disaster management and risk analysis – Degradation of pesticides, detergents, plastics and polymers.

Radio Active Waste: Sources – Radiation standards by ICRP – Other standards (AERB) –Low level and High level radioactive waste management –

UNIT – IV

Recycling of Wastes:Waste types – Sources – Waste generated per capita – Composition of wastes – Recycling of waste for Industrial, Agricultural and domestic purposes – Recycling of metal Products – Reuse, Recovery – Reduction of paper, plastics etc., - Recycling of food manufacturing, beverages, apparel, leather, paper, pulp, chemical and other industries – Fly ash utilization.

REFERENCES:

1. Jerry A Nathanson, **Basic Environmental Technology**, Prentice Hall of India Pvt. Ltd. (2003).
2. Rao M.N. and Datta A.K., **Waste Water Treatment**, Oxford & IBH Publishing Company Pvt. Ltd. (1987).
3. Hammer M.J., **Water and Waste Water Technology**, John Willey (1986).
4. Garg S.K., **Sewage Disposal and Air Pollution Engineering**, Khanna Publications (1990).
5. Goel P.K., (ed), **Advances in Industrial Waste Water Treatment**, Techno Science Publications, Jaipur (1999).
6. Gilbert M Masters, **Introduction to Environmental Engineering and Science**, Prentice Hall of India Pvt. Ltd (1998).

ENV- 302: ENVIRONMENTAL IMPACT ASSESSMENT, AUDIT AND ECONOMICS

UNIT – I

Environmental Impact Assessment: Definition – Purpose of EIA – Regulatory frame work in India – Base line data generation – Requiring and planning of field survey – Review of information required on development/industrial project – procedure for reviewing EI analysis and statement – EIA guidelines 1994 – Notification of Govt., of India – Identification of environmental risks due to developmental project activities – Preparation of on-site and off-site disaster management plans.

UNIT – II

Assessment Methodologies: Physical Environment Assessment – Flora Assessment – Plant Survey – Animal population size – Aquatic Assessment – Necessity of public participation in environmental decision making – Prediction and assessment of visual impacts of socio-economic environment.

Ecoplaning: Definition And concept – Land use policy for India – Urban and rural planning for India – Land use pattern – Cost benefit Analysis – Limits to Growth theory.

UNIT – III

Environmental Audit: Objectives – Scope – Coverage – Policy development – Defining boundaries – Goals – Policy compliance – Organization and staffing of Audit team – Resources – Approach to Audit ; (a) Pre-visit Activity (b) on-site activities – Understanding Management Systems – Assessing strengths and weaknesses – Audit evidence gathering and evaluation (c) Post Audit Activities – Audit principles – Benefits to Industry

UNIT – IV

Environmental Economics: Concepts of Economics and Scope of Environmental Economics – Economics of Pollution Control – Cost-Benefit Analysis and Evaluating Alternatives – Environmental Accounting – General Framework of Environmental Accounts.

REFERENCES:

1. Canter L.W., **Environmental Impact Assessment**, McGraw Hill Book Co, New York (1996).
2. Bregman J.L., **Environmental Impact Statements**, Lewis Publishers, London (1999).
3. Singleton R, Castle P and Sort D, **Environmental Assessment**, Thomas Telford Publishing, London (1999).
4. Eccleston C.H., **Environmental Impact Assessment – A comprehensive guide to project and strategic planning**, John Wiley and Sons (2000).
5. Murthi S, **Economic Growth and Environment**, RSBA Publishers (1998).

ENV. 303 (A) :: STATISTICS, COMPUTER APPLICATIONS AND MODELING

(Generic Elective)

UNIT – I

Statistics: Introduction – Measures of central tendencies – Arithmetic Mean – Dispersion – Variance – Standard Deviation – Coefficient of Variation – Simple Correlation – Linear Regression with two variables.

Tests of significance: Statistical Hypothesis – Null Hypothesis – Level of Significance – Large sample Tests for means – Sampling Distribution – Standard Error – Small sample tests based on t-distribution.

UNIT – II

Fundamentals of Computers: Introduction to computers – History of evolution - Organization and working of computer – Classification of computers.

Computer Hardware: CPU, Mother Board, Disk Drives, Memory, I/O Devices, Printers and plotters – Network peripherals – Modem.

Computer Software: System Software – Compiler and Interpreter – Application Software – Operating Systems – Fundamentals of DOS, UNIX and Windows operating systems – Computer languages.

UNIT – III

Fundamentals of MS-WORD, MS-EXCEL and MS-POWER POINT.

Computer Network and Internet: Advances of networking – Computer for communication – Internet – Search machines – Sending and receiving E-mail – Downloading files.

UNIT – IV

Ecological Predictions and Mathematical Modeling: Modeling – Nature of Mathematical Models – Basic Mathematical Tools used in Modeling – Elements used in Modeling – Limitations of models – Models for ecological predictions – Lotka-Volterra Model – Leslie's Matrix Model – Air Quality Model.

REFERENCES:

1. Peter Norton, **Introduction to Computers**, Tata McGraw Hill (1998).
2. Alexis Leon and Mathews Leon, **Fundamentals of Information Technology**, Leon Tech World, Chennai (2001).
3. Gupta S.P., **Introduction to Statistical Methods**, Chand Co.,(1985).
4. Gupta S.C. and Kapoor V.K., **Fundamentals of Applied Statistics**, Chand Co.,
5. Rajaraman V, **Fundamentals of Computers**, Prentice Hall of India (2000).
6. Jorgensen S.E., **Applications of Ecological Modeling in Environmental Management**, Elsevier, London (1996).
7. Henry C Perkins, **Air Pollution**, McGraw Hill (1974).

ENV. 303 (B):: Ecotourism and Eco-restoration

(Generic Elective)

UNIT - I

Concepts of Tourism: Classification – Religious Tourism – Cultural Tourism – Heritage Tourism – Monumental Tourism – Adventure Tourism – Sustainable Tourism – Consumptive and Non-consumptive Tourism – Origin of Ecotourism – Principles of Ecotourism – Types of Ecotourism – Concepts of Ecotourism – Objectives of Ecotourism – Benefits of Ecotourism.

UNIT – II

Study of Ecosystems: Places of interest of Ecotourism – Infrastructural facilities for Ecotourism – Maintenance of Ecological Centers – Important Biosphere Reserves – Ecotourism and Conservation – Study of different Ecosystems – Rain Forest Ecotourism – Mountain Ecotourism – Polar, Islands and Coasts Ecotourism.

UNIT - III

Impact of Ecotourism: Economic Impacts – Types and Degree of Impacts from Ecotourism activities – Socio-cultural Impacts – Ecotourism related organization – Trends affecting Ecotourism – Ecotourism Research – Disasters and Ecotourism.

UNIT – IV

Environmental Degradation: Major forms of Environmental Degradation – Causes and Consequences of Environmental Degradation.

Eco Restoration: Redressing of Ecological Poverty – Population Control – Attitudinal Changes – Rational Use of Resources – Restoring Soil Fertility, Soil Health – Optimum Use of Bio Resources – Eco Solutions.

REFERENCES

1. Weaver D.B., **The Encyclopedia of Ecotourism**, CABI Publishing, UK (2001).
2. Sinha P.C., **Encyclopedia of Ecotourism, Vol I, II and III**, Anmol Publications Pvt. Ltd., New Delhi (2003)

ENV-304 :: PRACTICAL - I

- Preparation of Activity-processes Flow Diagrams.
- Case Study analysis for EIA of a major industry.
- Case Study analysis for EIA of a Reservoir/Land Conversion/Mining activity.
- Preparation of Environmental Statement.
- Estimation of BOD content in industrial waste water.
- Estimation of degradable products from pesticides.
- Estimation of sedimentary particles by Jar Test.
- Calculation of mean, median and mode
- MS. Word
- MS. Excel
- MS. Power Point
- Internet

**ENV-305- COMPUTER APPLICATIONS AND TOXICOLOGICAL STUDY IN FOOD
ADULTERATION
(Skill Oriented Course)**

UNIT - 1

Computer and application in toxicology: Introduction to computers, basic unit and functions, H/W and S/W, operating systems, word processing, spread sheet, graphic programs, dbase, windows, statistical S/W programs and packages. Steps involved in S/W development, computer languages with emphasis to FORTRAN language and programming,

UNIT- II

Toxicology software systems. Use of computers in information retrieval systems, Technology development: Technology development-meaning; Drug related technology development; Toxicological studies, bioequivalence (BU), clinical trials-phase-I, phase-II and phase-III.

UNIT –III (P)

Detection of milk adulteration - Detection of starch in milk and milk products (khoya, chenna, paneer) - Detection of mashed potatoes, sweet potatoes and other starches in ghee/butter - Detection of sugar solution in honey - Detection of chalk powder in sugar/pithi sugar/jaggery - Detection of excess bran in wheat flour - Detection of added colour in food grains - Detection of rhodamine B in ragi.

UNIT-IV (P)

Detection of papaya seeds in black pepper - Detection of artificial/water soluble synthetic colours in chilli powder - Detection of saw dust in chilli powder - Detection of chalk in common salt - Detection of artificial colour in turmeric powder - Detection of malachite green in green vegetables like bitter gourd, green chilli and others - Detection of artificial colour on green peas - Detection of rhodamine B in sweet potato.

References

1. Advances in Molecular Toxicology by James C. Fishbein
2. Operating Systems: Internals and Design Principles by Stallings (Pearson)
3. Handbook of Food Adulteration and Safety Laws by Sumeet Malik
4. Molecular Toxicology by P. David Josephy .
5. Adulteration Analysis of some foods and drugs
6. Frontiers in drug safety volume 1 by Alankar Shrivastava
7. A.K. De. Environmental Chemistry, 1985
8. Sharma, B.K. Kaur H., Environmental Chemistry, Goel Publishing House (1995).’
9. Sharma.P.D., Environmental Biology and Toxicology, Rastogy (1994).

ENV. 306 (A) :: NATURAL RESOURCES CONSERVATION

(Open Elective)

UNIT – I

Natural Resources: Definition – Importance – Classification – Human physiological socio-economic and cultural development – Human Population Explosion – Natural Resource Degradation – Concept of conservation – Value system – Equitable resource use for sustainable life system.

UNIT – II

Forest Resources: Forest cover in India and the World – Importance – Desertification – Forest Wealth – Afforestation – Vanasamrakshna Samithi in A.P. – Agroforestry – Social Forestry – Joint Forest Management Strategy for Forest Conservation.

Wild Life: Resources – Importance – Benefits – Wild life Extinction – Causes for Extinction – List of Endanger species in India and in the World – Ecological approach in wild life management – Eco Tourism – Wild Life projects in India – Sanctuaries and National Parks In India – Man and Bio sphere Programme – Aesthetic type of Conservation by TTD.

UNIT – III

Land and Soil Resources: Soil, Complexity of soil nature, regional deposits, Land use and capability classification systems, Land use Planning models and their limitations. Impacts of natural and man-made activities on land characteristics and land use planning – Soil Erosion – Loss of Soil Nutrients – Restoration of Soil Fertility – Soil Conservation Methods and Strategies in India.

Wet Land Conservation and Management – Ecological Importance of wet lands in India – Conservation Strategy and ecological Importance.

Water Resources: Rivers and Lakes In India – Water Conservation and ground water level increase - - Watershed Programme.

UNIT – IV

Mineral Resources: Use and exploitation – Environmental effects of extracting and using mineral resources – Restoration of mining lands – Expansion of supplies by substitution and conservation.

Food Resources: World Food Problems – Changes caused by agriculture – overgrazing effects of modern agriculture – Fertilizer-Pesticide problems – Water Logging – Salinity – Sustainable agriculture, life stock breeding and farming.

REFERENCES:

1. Haue R and Freed V.H., **Environmental Dynamics of Pesticides**, Menum Press, London (1975).
2. Singh B, **Social Forestry for Rural Development**, Anmol Publishers, New Delhi (1992).
3. Shafi. R., **Forest Ecosystem of the World**, (1992)
4. Trivedi R.K., **Environment and Natural Resources Conservation**, (1994).
5. Murthy J.V.S., **Watershed Management in India**, (1994).
6. Raymond F Dasmann, **Environmental Conservation**, John Wiley (1984).
7. Nalini K.S., **Environmental Resources and Management**, Anmol Publishers, New Delhi (1993).
8. Land use in Mining Area of India, Rekha Ghosh, Envis, ISM Dhanbad, ISSN 0972-4656
9. Environmental Land use planning and Management, John Randolph, Island Press.

ENV. 306 (B)::ENVIRONMENTAL EDUCATION

(Open Elective)

UNIT – I

Knowledge of Environment: About the environment – Humanity-Environment relationship – Population growth – Problems – Rational use of resources – Objectives of environmental education – Guiding principles – UNESCO 1977 recommendations – Environmental programmes – Environmental education in India – Classification of environmental education programmes.

UNIT – II

Environmental Education: Environmental education at primary, secondary and tertiary level – Non-formal environmental education – Environmental education for professional level groups.

Environmental Organizations and Agencies: International Bodies, MAB, Government and Non-government (Voluntary) Organizations – Environmental administrative control – Central and State Pollution Control Boards – Department of Environment and Forests – Special Technologies.

UNIT – III

Sustainable Development: Definition, Scope and Importance – Causes of unsustainability – Ecological footprints – Guidelines for sustainable development and reduction of poverty – Earth's ethics for sustainable living – Ethical guidelines – UN Conference on human environment – Environment and Development and Earth Summit.

UNIT – IV

Future Challenges to Society: Environmental priorities in India and strategies for action – Population stabilization – Integrated land use planning – Healthy cropland and grassland – Woodland and revegetation – Conservation of biological diversity – Control of pollution – Development of non-polluting renewable energy systems – Recycling of waste and residues – Ecologically compatible human settlements and slum improvements – Environmental education and awareness – Updating environmental laws – Rain water harvesting and new dimensions to national security.

REFERENCES:

1. Cunningham W and Cunningham M.A., **Principles of Environmental Science**, McGraw Hill, London (2003).
2. Joseph K and Nagendran R, **Essentials of Environmental Studies**, Pearson Education, Delhi (2004).
3. Agarwal K.M., Sikdar P.K. and Deb S.C., **A Text Book of Environment**, Mac Millan India Ltd, Kolkatta (2002).
4. Tyler Miller Jr. G, **Living in the Environment – Principles, Connections and Solutions**, Wadsworth Publishing Co., New York (1996).
5. Wright R.T. and Nebel B.J., **Environmental Science – Towards Sustainable Future**, Prentice Hall, New Delhi (2002).

SEMESTER-IV

ENV. 401:: WATER RESOURCES AND WATERSHED MANAGEMENT

UNIT - I

Introduction: Hydrological Cycle – Formation and its Importance – Rain fall – Surface water – Ground water – Soil water and plant relationship.

Water Table – Water Budget – Global Water Balance and Distribution – Importance of Streams, Rivers, Lakes and Ponds.

UNIT – II

Water and Society: Water Usage – Overdrawing of Water and its consequences – Water shortage – Water Table and Depletion – Surface Water - Causes for diminishing surface water – Land subsidence – Salt water intrusion – Hydraulic gradient – Darcy's Law – Cone of depressions – Capture-zone curves – Control of ground water plumes – Factors for drought formation – Consequence of drought – Problem of irrigation water – Conflicts over water.

UNIT - III

Water Quality and Waste Water Treatment: Population explosion – Causes and Consequences –Water Quality Standards – Need for safe drinking water – Safe Drinking Water Act – Water Quality in Lakes and Reservoirs – Ground Water – Water born diseases – Water distribution and sanitary sewer systems – Sources of water pollution – Waste Water Treatment – Environmental Legislation for water conservation – Water Act 1974 – Future needs and alternate sources of water – Additional Remediation Technology.

UNIT – IV

Water Harvesting and Management: Water Resources – Indian and A.P. Scenario – Traditional Water Management System – Methods for ground water infiltration – Recharge pits for individual house plot – Watershed Management – Catchment Area Developments – Command Area Development – Cropping Pattern – Cloud Seeding – Big Dams – Benefits and Problems – Equitable use of water resources for sustainable growth and development.

REFERENCES:

1. Gilbert M Masters, **Introduction to Environmental Engineering and Science**, Prentice Hall of India Pvt. Ltd. (1998).
2. Kumar A, **Ecology and Conservation of Lakes, Reservoirs and Rivers**, ABD Publishers, Jaipur (2004).
3. Goel P.K., **Water Pollution: Causes, Effects and Control**, New Age International Pvt. Ltd. (1996).
4. Eckenfelder, **Industrial Water Pollution and Control**, Wesley Publications (1997).
5. Sharma V.K., **Water Resources – Planning and Management**, Himalaya Publishing House (1985).

ENV. 402:: REMOTE SENSING AND GIS

UNIT – I

Basic Concepts and Fundamentals: Remote Sensing – Basic concepts – Physics of Remote Sensing – Energy interaction with atmosphere – Energy interaction with earth surface features – Aerial photographs – Interpretation principles and techniques.

Earth Resources Satellites – IRS – Land sat satellites – SPOT, TRS Programmes – Meteorological and ocean monitoring satellites.

UNIT – II

Sensors and Scanners: Sensors – Optical – Thermal – Microwave – Sensor Characteristics – Scanners – Digital – Geocoded – Multispectral and thermal Imagers.

Microwave Remote Sensing: Basic principles – SAR, SLAR Operations – Characteristics of RADAR signals – Earth surface characteristics influencing RADAR returns – Interpretation of microwave data.

Digital Image Processing: Basic principles – Techniques – Image enhancement – Edge enhancement – Image classification – Data merging and GIS Integration – Biophysical modeling.

UNIT – III

Satellite Data Applications: Resource management – Forest, Water, Ground Water, Soil, Agricultural, Land use, Wasteland – Quantitative Estimation – Yield Estimation – Coastal Zone Changes.

GIS Applications: Fundamentals of GIS – Applications for Infrastructure, Ground Water, Land use planning, Watershed management – Rainfall, Runoff etc. – GPS types and applications.

UNIT – IV

Environmental Applications of RS and GIS: Impact Assessment – Pollution Monitoring – Land Degradation – Desertification – Industry – Mining – Ground Water – Damage Assessment – Coastal and Marine applications – Satellite System – IKONAS – QUICKBIRD – CARTOSAT – ENVISAT – TRMM – EOS Missions – Integral Earth Observation Studies – Global Change.

REFERENCES:

1. Berry S Siegal and Allen R Gillspie, **Remote Sensing in Geology**, Tata McGraw Hill Publishing Co. (1987).
2. Lillesand and Kiefer, **Remote Sensing and Image Interpretation**, John Wiley (1987).
3. Chouhan and Joshi K.N., **Applied Remote Sensing and Photo Interpretation** (1991).
4. Rajan M.S., **Remote Sensing and GIS for Natural Resources**.
5. Elangovan, **GIS Fundamentals, Applications and Implications**, NIPA, New Delhi (2006).
6. Elachi C, **Introduction to Physics and Techniques of Remote Sensing**, John Wiley, New York (1978).

ENV. 403 (A)::ENVIRONMENTAL SAFETY
(Generic Elective)

UNIT-I

Scope and Importance; need for public awareness about our environment; Economic and social security; Environment impact of transportation and Mining. Environmental impact assessment (EIA) — purpose, procedure and benefits of EIA; Biodiversity and its conservation; Sustainable development. Global warming and greenhouse effect, urbanization, acid rain, ozone layer depletion, nuclear accident and holocaust.

UNIT- II

Case studies, population explosion, family welfare programmers-HIV/AIDS, women and child welfare, Environmental pollution — causes, Effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution and nuclear hazards, Solid waste management-urban and industrial waste-causes, effects and control measures.

UNIT-III

Renewable and non-renewable natural resources — Forest resource, Water resource, Mineral wealth / resource, Food resource, Energy resources, Growing energy needs, renewable and non-renewable energy sources, Use of alternate energy sources, Land resource and land degradation, Role of an individual in conservation of natural resources, equitable use of resources for sustainable life styles.

UNIT-IV

Role of Government in environment protection, legal aspects of environment protection, NGO initialization, National Committee on environmental Planning (NCP), Environmental Appraisal Committee (EAC), central and state boards for prevention and control of pollution, goals of environment impact policy, case studies, Disaster management floods, earth quake, cyclone, landslides, role of individual in prevention of pollution.

References:

1. Benny Joseph (2005) Environmental Studies — Tata McGraw Hill - Publishers.
2. Rao CS (2006) - Environmental Pollution Control — New Age International Pvt. Ltd Publishers.
3. ManjunathD..L (2007) - Environmental Studies - Pearson Education Publishers.
4. Yaji R.K (2006) - Text Book of Environmental Studies - United Publishers.
5. Centre for Environmental Education (1990) - Essential learning's in Environmental education.
6. Venugopal Rao P (2006) - Principles of Environmental Science and Engineering —Prentice Hall.

ENV. 403 (B)::DISASTER MITIGATION AND MANAGEMENT

(Generic Elective)

UNIT-I

Natural disasters: Cyclone – Tornadoes – Avalanches – Flood – Drought – Volcano – Earthquake – Fire – Landslide – Forecasting and Warning System – Disaster Education – Safety Measures – Impact on environment.

UNIT-II

Disaster Management: Pre-disaster Planning – Toning of disaster prone areas – Prioritization – Regulations – Protection measures during disaster – Post-disaster Relief Camp Organization – Survey and Assessment – Disaster Management Cycle - Vulnerability Analysis – Warning System – Legal Aspects – Case Studies for disaster management.

UNIT-III

Disaster preparedness and training: Community preparedness in natural disasters – Role of NGOs, Executives and Army for disaster reduction and mitigation in local conditions.

UNIT-IV

Risk Analysis and Assessment: Basic concepts – Purpose of risk analysis – Tools for risk assessment – Toxicology – Epidemiology - Exposure Modeling – Significance of risk and management – Evaluation of accidents in industrial processes – Assessment of risk to ecosystem and human health from GMOs – Psychology of risk – Economic evaluation of risks – Experiences of World Bank – Risk Communication – Frame work for sustainable development.

REFERENCES:

1. Cuttler S, **Environmental Risk and Hazards**, Prentice Hall of India, New Delhi (1994).
2. Shailendra K Singh, Subhash C Kundu and Shobu Singh, **Disaster Management**, Mittal Publications, New Delhi (1998).
3. Ricci P.F. and Rowe M.D. (ed), **Health and Environmental Risk Assessment**, Pergman Paper, New York (1985).
4. Peter Calow, **Environmental Impact Assessment**, McGraw Hill Inc., New Delhi (1998).

ENV 404: PRACTICAL-I

1. Determination of amount of Zn, Cu and Cr in surface water.
2. Estimation of amount of E-coli in drinking water.
3. Estimation of the amount of NO_2^- , NO_3^- in ground water samples.
4. Interpretation of drainage characteristics from aerial photographs.
5. Geo morphological Characters Appreciation from aerial photos.
6. Watershed development from aerial photos.

ENV. 405: PROJECT WORK AND COMPREHENSIVE VIVA-VOCE (Multidisciplinary)

ENV. 406 (A)::FOREST RESOURCES AND MANAGEMENT

(Open Elective)

UNIT-I

Introduction – Forest Ecology – Basic concept and approaches to ecology – community ecology – characters used in community structure – Habitat ecology – Fresh water, marine, estuarine terrestrial ecology – desert ecology.

UNIT-II

Phytogeography: Major plant communities of the world – phytogeographical regions of the world - Soil climate – Flora and vegetation of India – Floristic regions of India – Endemism.

UNIT-III

Environmental Organizations and Agencies: National and International environmental organizations – Ministry of Environment and Forest (government) – International Agency Frame Work on environmental conservation.

UNIT-IV

Emerging concepts in conservation of forest and action plan – Conserving forest genetic resource from theory and practice – Action Plans and research need to conservation – Threats and mitigation measures.

REFERENCES:

1. Odum E.P., **Fundamentals of Ecology**, WB Saunders Co., London (1971).
2. Ramakrishnan P.S., **Mountain Biodiversity, Land Use Dynamics, Traditional Ecological Knowledge**, Oxford and IBH Publications Pvt. Ltd., New Delhi (2000).
3. Krishnamurthy K.V., **An Advanced Text Book on Biodiversity**, Oxford and IBH Publications Pvt. Ltd., New Delhi (2004).
4. Ramesh B.R. and Pascal J.P., **Atlas of Endemics of the Western Ghats**, French Institute, Pondichery (1997).

ENV 406 (B): GLOBAL ENVIRONMENTAL ISSUES

(Open Elective)

UNIT - I

Global Climate Changes: Global Warming – Effect of global warming on hydrological cycle – Carbon Budget – Control Measures – Greenhouse Effect – Sources and Sinks of greenhouse gases.

UNIT - II

Atmospheric Pollution in Global Climate: Importance of stratosphere – Ozone depletion – Effect of ozone depletion on environment – Ways of protecting ozone layer – Acid Rain – Impact of acid rain on environment – Major Air Pollution Episodes.

UNIT - III

Radiation and Environment: Sources of radiation – Radioactive pollutants – Radioactive isotopes and their application – Effect of radiation on plants and animals at genetic level – Disposal of radioactive wastes – Nuclear Episodes – Radiation protection and control measures.

UNIT - IV

Future Challenges: Population stabilization - Integrated land use planning – Healthy cropland and grassland - woodland and re vegetation – Conservation of biological diversity – Control of pollution – Development of nonpolluting renewable energy systems – Recycling of waste and residues – Ecologically compatible human settlements and slum improvements – Environmental awareness and education – Updating environmental laws and new dimension to human towards environment.

REFERENCES:

1. Manahan S.E., **Environmental Chemistry**, Lewis Publishers, New York (2000).
2. Daley M.J., **Nuclear Power: Promise or Peril**, Lerner Publishing Minneapolis (1997).
3. Cheremisinoff N.P., **Handbook of Industrial Toxicology and Hazardous Materials**, Marcel Dekker, New York (1999).
4. Botkin, D.B. **Changing the Global Environment**, Academic Press, San Diego (1989).

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FIRST SEMESTER
Branch - Environmental Science
Paper-I-ENV.101: ECOLOGY AND ENVIRONMENT
(Under CBCS)

Time:3 hours

Max. Marks:80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Give a brief account on sustainable development.
2. Discuss the importance of biological cycles.
3. Discuss briefly on human population control methods.
4. Explain in brief about the population and community.
5. Classify the types of ecological pyramids of energy flows.
6. What are the food chains and food webs of ecosystem?
7. Give a brief note on the Nitrogen Fixing bacteria.
8. Discuss briefly on maintenance of Eco-balance.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Define Ecology? Explain Man and Environment Relationships.
Or
(b) Explain the scope and importance of environmental science.
10. (a) Give an account on Human Population growth effect on environment.
Or
(b) Explain Liebig's law of minimum and Shelford's law of tolerance
11. (a) Write on the structure, components and functions of an ecosystem.
Or
(b) Explain the concepts of ecological Niche and classify various types of Niches.
12. (a) What are biogeochemical cycles and explain their importance role in environment?
Or
(b) Discuss on ecological aspects and their importance for eco-balance maintenance.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FIRST SEMESTER
Branch - Environmental Science
Paper-II-ENV.102: ENVIRONMENTAL CHEMISTRY
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Discuss the mechanism involved in ozone depletion.
2. Illustrate the impacts of acid rain.
3. Write briefly on the impacts toxic chemicals in the environment.
4. Discuss the role of bio-transformations in pollution control.
5. Comment on the role of bio-indicators.
6. Biodegradation and its role in pollution monitoring.
7. Impacts of eutrophication on aquatic system.
8. Write briefly on bio-remediation.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Write about various chemical reactions and role in the production of secondary pollutants in the atmosphere.
Or
(b) Explain the process of global warming and its effects on troposphere.
10. (a) Illustrate the biochemical aspects As, Cd, Pb and PAN in atmosphere.
Or
(b) Discuss in biotransformation of oranochlorine pesticides.
11. (a) Write about micro and macro nutrients in the soils.
Or
(b) Illustrate the effects of non-degradable wastes on the environment.
12. (a) Discuss the types catalysts and their role in green chemistry.
Or
(b) Write different types of reaction in various water bodies including marine environment.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FIRST SEMESTER
Branch - Environmental Science
Paper-III-ENV.103 (A): ENVIRONMENTAL TOXICOLOGY AND PUBLIC HEALTH
(Compulsory Foundation)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Explain the causes and consequences of deforestation.
2. Discuss the disadvantages of mining.
3. Only female mosquitoes bite the humans. Give the reasons.
4. Avian flu was declared as pandemic disease. Discuss.
5. Why are vaccines failing to control HIV?
6. Differentiate the systems between flu and Pneumonia?
7. What is the meaning occupational health hazard? Give any three examples.
8. Discuss various kinds of diseases spread mosquitoes.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Discuss the damages caused to environment because of industrialization.
Or
(b) Explain, how huge reservoir on account of large dams worsens the crisis of global warming.
10. (a) Explain Hg related toxic effects on humans.
Or
(b) Define LD50 and discuss its application in toxicological research.
11. (a) Discuss occupational health hazards of people working in coal mines.
Or
(b) Write in detail about the causes, consequences of algal blooms.
12. (a) Discuss vehicular exhaust related health problems in cities.
Or
(b) Prevention is better than cure. Why is it true in case of AIDS.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FIRST SEMESTER
Branch - Environmental Science
Paper-III-ENV.103 (B): OCCUPATIONAL HEALTH AND INDUSTRIAL SAFETY
(Compulsory Foundation)
(Under CBCS)

Time:3 hours

Max. Marks:80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Write a brief note impact of Hazards.
2. Give brief account on aid and management of medical emergencies.
3. Briefly explain the industrial safety measures.
4. Explain briefly inflammable materials.
5. Write a brief note on Threshold Limit Values.
6. Write a note on Factories Act, 1948.
7. Briefly explain hazards control measures.
8. Write a brief note on causes of accident.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Give an account on occupational diseases and occupationally induced illness.
Or
(b) Explain in detailed health problems in different types of industries.
10. (a) Give a detailed account on industrial safety management techniques.
Or
(b) Discuss on principles and functions in safety management.
11. (a) Explain the personal and biological monitoring of hazards exposure.
Or
(b) Write in detailed note on occupational hazards in industry.
12. (a) Give a detailed account on safety audit.
Or
(b) Discuss in detail about the controlling measures of hazards.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FIRST SEMESTER
Branch - Environmental Science
Paper-IV-ENV.104 (A):BIODIVERSITY CONSERVATION AND MANAGEMENT
(Elective Foundation)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR of the following questions. Each question carries 5 Marks (Marks: 4x5=20)

1. Explain the concept of ecosystem diversity.
2. Give a note on biodiversity in tropical regions.
3. Write a brief note on hierarchical diversity.
4. Discuss on biodiversity registers.
5. Ex-situ conservation measures.
6. Patent Act and Agenda 21.
7. Ecological significance of biodiversity.
8. Status of Tiger project in India.

PART-B

Answer ALL questions .Each question carries 15 marks. (Marks: 4x15=60)

9. (a) Explain in detail the climatic regions and vegetation types of the world.
Or
(b) Discuss the case study on biodiversity of coral reef ecosystem of India.
10. (a) Explain various indices for estimating the diversity of large communities.
Or
(b) Write an account on alpha and beta diversity measures.
11. (a) Discuss on national biodiversity strategy and action plan programmes.
Or
(b) Give an account on germ plasma reservation and gene banks concepts.
12. (a) Write about the major conventions on biodiversity and their significance.
Or
(b) Give an account measures in conservation of the national biodiversity.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FIRST SEMESTER
Branch- Environmental Science
Paper-IV- ENV. 104 (B): ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE
DEVELOPMENT(Elective Foundation)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Explain the impact of population growth on environment.
2. Write the objectives of environmental education.
3. Discuss the non-formal environmental education.
4. Give a brief note on non-government (voluntary) organizations.
5. Define sustainable development.
6. Explain the causes of unsustainability.
7. Write a brief account on control measures of pollution.
8. Describe the rain water harvesting.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Explain the classification of environmental education programmes.
Or
(b) Discuss the environmental education in India.
10. (a) Discuss in detail the environmental education for professional level groups.
Or
(b) Describe the Environmental organizations and agencies.
11. (a) Write an essay on scope and importance of sustainable development.
Or
(b) Give a detail account on guidelines for sustainable development and reduction of poverty.
12. (a) Explain environmental priorities in India and strategies for action.
Or
(b) Write a detail note on conservation of biological diversity.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
SECOND SEMESTER
Branch- Environmental Science
Paper-I-ENV.201: ENERGY AND ENVIRONMENT
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Classification of energy resources.
2. Fossil fuels.
3. Solar ponds.
4. Parabolic solar collections.
5. Tidal energy.
6. Biogas.
7. Future energy –hydrogen energy.
8. Bureau of energy Efficiency (BEE).

PART-B

Answer ALL questions. Each question carries 15 marks

(Marks: 4x15=60)

9. (a) Write the importance and need of non conventional energy sources in energy production of India.

Or

- (b) Discuss the positive and negative aspects of fossil based energy, production, in India.

10. (a) Discuss the role of solar photo voltaic ,system in off grid applications.

Or

- (b) Explain the different kinds of concertinaing types of solar energy production.

11. (a) Discuss about the mechanism role and importance of wind energy.

Or

- (b) Describe the energy production from nuclear fission energy process and why India in relatives by the producing less percent of nuclear energy.

12. (a) Describe the strategy of India in achieving energy security and how future options will be implemented..

Or

- (b) Describe the energy supply and demand gap and how India justifies in increases the role of alternative energy resources.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
SECOND SEMESTER
Branch- Environmental Science
Paper-II –ENV. 202: ENVIRONMENTAL POLLUTION
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. .Write a short notes on hydrocarbons.
2. Describe dosimetry.
3. Write short notes on hardness of water.
4. Write short notes on various forms of nitrogen.
5. Write short notes on macronutrients of soil.
6. Write notes on impingers
7. Describe noise.
8. Write short notes on radiations.

PART-B

Answer ALL questions. Each question carries 15 marks

(Marks: 4x15=60)

9. . (a) Write in details about sampling and analysis of CO₂.
Or
(b) Write in detail about sampling and analysis fluoride.
10. (a) Write an essay on sampling and analysis of polluted waters.
Or
(b) Write an essay on 'Blue baby syndrome'.
11. (a) Write an essay on sampling and analysis of contaminated soils.
Or
(b) Write an essay on oil pollution and its marine life.
12. (a) Discuss in detail noise control and prevention methods.
Or
(b) Discuss in detail radiation protection and control measures.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
SECOND SEMESTER
Branch- Environmental Science
Paper-III-ENV. 301 (A): INSTRUMENTAL TECHNIQUES AND
APPLICATIONS(Compulsory Foundation)
(Under CBCS)

Time:3 hours

Max. Marks:80

PART- A

Answer any FOUR questions. Each question carries 5 Marks (Marks: 4x5=20)

1. State and explain Beer- Lambert's law.
2. Write the principle and applications of Flamephotometry.
3. Explain the basic instrumentation of Atomic Absorption spectrophotometer.
4. Write the principle and applications of GraphiteFurnace.
5. Explain Ascending Development technique in paperchromatography.
6. Write the preparation Thin Layer Chromatographic plate(TLC).
7. Explain the principle and applications of Radio carbon dating.
8. Explain the application of Nanomaterials.

PART-B

Answer ALL questions .Each question carries 15 marks. (Marks: 4x15=60)

9. (a) Describe the instrumentation principle and applications of Spectrophotometer.
Or
(b) Explain the use of spectroscopic Techniques for trace metal analysis in environment.
10. (a) Describe the principle and advantages of Inductively Coupled Plasma (ICP) Techniques.
Or
(b) Describe the principle, instrumentation and applications of flame emission spectrometry.
11. (a) Describe the theory, principle and applications of Ion Exchange Chromatography.
Or
(b) Explain briefly about the community environment and its hazards.
12. (a) Describe the energy efficient resource and materials for sustainable development.
Or
(b) Explain the Nano Engineering materials for prevention of Environmental pollution.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
SECOND SEMESTER
Branch- Environmental Science
Paper-III-ENV.203 (B):Environmental Geology (Compulsory Foundation)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Write a short note formation of hydrological cycle.
2. Describe the rock cycle.
3. What are examples of geologic catastrophe? Explain briefly.
4. Write a short note hazardous prediction.
5. Describe the causes of flooding.
6. Give a brief note on impact of landslides.
7. Explain the importance of minerals.
8. Write a short note on EIA.

PART-B

Answer ALL questions. Each question carries 15 marks

(Marks: 4x15=50)

9. (a) Write an essay on Biogeochemical cycles.
Or
(b) Explain the special problems of time in geology.
10. (a) Write a detail note on geological hazardous and its risks.
Or
(b) Define hazard adjustment. Explain in detail management of hazards.
11. (a) Write an essay on volcanism.
Or
(b) Describe in detail about the avalanches.
12. (a) Write in detail note on uses of minerals in human life.
Or
(b) Explain about the recycling of mineral resources.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
THIRD SEMESTER
Branch- Environmental Science
Paper-IV-ENV-204 (A): ENVIRONMENTAL LAWS, POLICIES AND LEGISLATION
(Generic Elective)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks(Marks: 4x5=20)

1. Write briefly on environmental ethics.
2. What is environmental protection?
3. Write about any environmental organization of national level.
4. EIA notification.
5. Salient features of environmental policy of India.
6. What is economic development?
7. Objectives of water (prevention and control of pollution) Act, 1998.
8. Salient features of plastic act, 2000.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) "Dilution is not solution for control of pollution". Discuss.
Or
(b) Delineate the efforts of the Indian government for environmental protection.
10. (a) Discuss the government establishment for planning and enforcement of environmental legislations.
Or
(b) Discuss the relevance and significance of ISO 14000.
11. (a) Explain the areas where public awareness and participation are needed for environmental protection.
Or
(b) Discuss in detail the national land use policy of 1998.
12. (a) Delineate the salient features of the biomedical waste act of 1999 and the rules therein for the disposal of these wastes.
Or
(b) Discuss the role of Indian industry in environmental protection.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
SECOND SEMESTER
Branch- Environmental Science
Paper-IV-ENV-204 (B):SOIL BIOLOGY (Elective Foundation)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Explain briefly soil texture.
2. Describe the ecological niche.
3. Write a short on soil biota.
4. Discuss briefly soil erosion.
5. Write a brief note allelochemicals.
6. Describe the soil role in plant growth.
7. Explain the importance of mycorrhizal in soil.
8. Write a short note on desertification.

PART-B

Answer ALL questions. Each question carries 15 marks

(Marks: 4x15=50)

9. (a) Give a detail account on decomposition of soil organic matter.
Or
(b) Explain the Economic importance of soil microbes.
10. (a) Discuss about the ecological interactions of microbes in soil.
Or
(b) Write in detail note on plant-soil relationship.
11. (a) Write an essay on carbon and nitrogen cycles.
Or
(b) Write a detail note on sulphur and phosphorous cycles.
12. (a) Describe the environmental problems in India.
Or
(b) Explain about the bioremediation of contaminated soils.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
THIRD SEMESTER
Branch - Environmental Science
Paper-I- ENV.301: WASTE TREATMENT AND MANAGEMENT
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR of the following questions. Each question carries 5 Marks (Marks: 4x5=20)

1. Mention the different sources of water.
2. Discuss on desalination.
3. Explain the disinfection of treated sewage.
4. Write a note on sewage disposal by dilution.
5. Explain incineration method.
6. What are the common sources of radioactivewaste?
7. Explain the 3R's in the waste management.
8. Write a note on composition of waste.

PART-B

Answer ALL questions .Each question carries 15 marks. (Marks: 4x15=60)

9. (a) What is Filtration? With a neat diagram explain the working of rapid sand and slow sand filtration.

Or

- (b) Explain the reclamation and reuse of domestic and industrial waste water..

10. (a) Explain briefly the performance of primary sedimentation tank is sewage treatment.

Or

- (b) Describe the methods adopted in disposal of sludge.

11. (a) Explain the possible environment impacts of mining and power plant discharges..

Or

- (b) Define hazardous waste and add a note on waste minimization methods.

12. (a) Describe the recycling of chemical and leather industry waste.

Or

- (b) Explain the recycling of metal products and add a note on flyash utilization.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
THIRD SEMESTER
Branch - Environmental Science
Paper-II-ENV.302: ENVIRONMENTAL IMPACT ASSESSMENT, AUDIT AND
ECONOMICS
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR of the following questions. Each question carries 5 Marks (Marks: 4x5=20)

1. Explain base line data generation.
2. Discuss the EIA notification of Govt. of India.
3. Explain the aquatic assessment.
4. Write a note on land use pattern.
5. Discuss on policy development.
6. Comment on approach to audit.
7. Explain the economical of pollution control.
8. Define the concepts of environment economics.

PART-B

Answer ALL questions .Each question carries 15 marks. (Marks: 4x15=60)

9. (a) “EIA is an essential tool for planning” comment the statement.
Or
(b) Explain about procedure for reviewing EI analysis and statement.
10. (a) Discuss the necessity of public participation in environmental decision making.
Or
(b) Describe the urban and rural planning for India.
11. (a) Explain the signification of audit and describe methodology for an environmental audit.
Or
(b) Give an account of consumption and pollution audit..
12. (a) Discuss the scope of environmental economics and add a note on environmental accounting
Or
(b) Explain in detail about the general framework of environmental accounts.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
SECOND SEMESTER
Branch - Environmental Science
Paper- III- ENV.303 (A): STATISTICS, COMPUTER APPLICATIONS AND MODELLING
(Elective Foundation)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR of the following questions. Each question carries 5 Marks (Marks: 4x5=20)

1. Explain the meaning of coefficient of variation.
2. Explain standard error.
3. Give the merits and demerits of table tops.
4. Describe network peripherals.
5. Advantages of MS word.
6. What is E-mail?
7. List out the elements used in modeling.
8. Ecological predications.

PART-B

Answer ALL questions .Each question carries 15 marks. (Marks: 4x15=60)

9. (a) Explain linear regression with two variables.

Or

- (b) Explain calculation and application of standard deviation.

10. (a) Give a detailed account on the classification of computers.

Or

- (b) Describe the fundamentals of DOS.

11. (a) Explain how computer and internet is used for downloading files.

Or

- (b) Is computer networking a boon or bone? Discuss.

12. (a) Discuss the nature of mathematical models.

Or

- (b) Give a comparative account on the models for ecological predications.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
THIRD SEMESTER
Branch - Environmental Science
Paper- III-ENV. 303 (B): ECOTOURISM AND ECO-RESTORATION (Generic Elective)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR of the following questions. Each question carries 5 Marks (Marks: 4x5=20)

1. Write a brief note on Concepts of Tourism..
2. Give brief account on benefits of Ecotourism.
3. Briefly explain about important biosphere reserves.
4. Write a short note on rain forest ecotourism.
5. Write a briefnote on impact of Ecotourism.
6. Give a brief note on effects of disasters.
7. Briefly explain major causes of Environmental Degradation.
8. Define Eco Restoration. Explain briefly.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Give a detailed account on Sustainable Tourism.

Or

- (b) Explain the consumptive and non-consumptive tourism.

10. (a) Write an essay on study of different Ecosystems.

Or

- (b) Describe the mountain Ecotourism.

11. (a) Explain the consequences of socio-cultural on Ecotourism.

Or

- (b) Write in detail on ecological trends affecting Ecotourism.

12. (a) Describe causes and consequences of environmental degradation.

Or

- (b) Discuss in detail about the Eco Solutions.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
THIRD SEMESTER

Branch - Environmental Science (Under CBCS)

**Paper-IV- ENV-305: COMPUTER APPLICATIONS AND TOXICOLOGICAL STUDY IN
FOOD ADULTERATION**

(Skill Oriented Course)

Time: 1½ hour

Max. Marks: 40

PART- A

Answer any FOUR of the following questions. Each question carries 5 Marks (Marks: 4x5=20)

1. Explain history of computers.
2. Discuss the importance of MS Word.
3. Write notes on operating systems.
4. Write a note on bioequivalence.
5. Discuss clinical trials-phase-I.
6. Write about clinical trials-phase-II.
7. Write about clinical trials-phase-II.
8. Write a short note on clinical trials-phase-III.

PART-B

Answer ALL questions .Each question carries 10 marks.

(Marks: 2x10=20)

9. (a) Explain in detail about functions of computer.

Or

- (b) Explain about graphic programs in computers.

10. (a) Discuss the Technology development for toxicological studies.

Or

- (b) Describe the Drug related technology development.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
THIRD SEMESTER
Branch - Environmental Science
Paper-V –ENV-306 (A): NATURAL RESOURCES CONSERVATION(Open Elective)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR of the following questions. Each question carries 5 Marks(Marks: 5x4=20)

1. Write a brief note on equitable resources use in life styles.
2. Give brief account on natural resources degradation.
3. Briefly explain the concept of Joint Forest Management Strategy.
4. Write note on the limitations of land use planning models.
5. Write brief the concept of Sanctuaries and National Parks.
6. Give a brief note on the importance Ramsar Convention.
7. Briefly explain the Rain water harvesting programmes in India
8. Write a brief note on impacts of overgrazing on soil fertility

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Give an account on definition, types and significance of Natural Resources.

Or

- (b) Explain the conservation measures for the protection of forest resources.

10. (a) What is meant by desertification and give an account on its impacts?

Or

- (b) Discuss on applied ecological principles in wildlife conservation and management.

11. (a) Explain the various types of soil conservation methods and strategies in India.

Or

- (b) Write in detail on ecological importance of wetlands and its conservation practice.

12. (a) Write a note on acid mine drainage and explain methods of restoration of mining lands.

Or

- (b) Discuss in detail about the sustainable agriculture practices and food security in India.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
THIRD SEMESTER
Branch III - Environmental Science
Paper-V –ENV. 306 (B): ENVIRONMENTAL EDUCATION (Open Electives)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR of the following questions. Each question carries 5 Marks (Marks: 4x5=20)

1. Write a brief note on the environment.
2. Give a brief account on objectives of environmental education.
3. Briefly explain the levels in environmental education.
4. Write the role of environmental organizations in education.
5. What is mean by sustainable development? Explain briefly.
6. Give a brief note on the Earth summit.
7. Briefly explain the integrated land use planning in India.
8. Write a brief note on rain water harvesting.

PART-B

Answer ALL questions .Each question carries 15 marks. (Marks: 4x15=60)

9. (a) Explain in detailed the relation between man and environment.

Or

- (b) Write an essay on environmental awareness programmes in India.

10. (a) Give a detailed note on the value and importance of environmental education.

Or

- (b) Discuss the role of pollution control board for in protection of the environment.

11. (a) Explain the scope and importance of sustainable development.

Or

- (b) Write in detail note on ecological footprints.

12. (a) Discuss about the environmental priorities in India.

Or

- (b) Discuss in detail about pollution control measures.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FOURTH SEMESTER
Branch- Environmental Science
Paper-I- ENV. 401: WATER RESOURCES AND WATERSHED MANAGEMENT
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks(Marks: 4x5=20)

1. Explain the Importance of lakes.
2. Write a short note on soil, water and plant relationship.
3. Write about the consequences of over drawing of water.
4. Explain the salt water intrusion
5. Describe the water quality standards.
6. Write a brief note on water borne diseases.
7. Explain the catchment area developments.
8. Describe the problems of big dams.

PART-B

Answer ALL questions .Each question carries 15 marks.(Marks: 4x15=60)

9. (a) Describe hydrological cycle in detail write its importance.

Or

- (b) Discuss the global water balance and distribution.

10. (a) Write the causes for diminishing surface water. What are the factors for drought?

Or

- (b) Discuss the conflicts over water. Explain problems of irrigation water.

11. (a) Explain the sources of water pollution and wastewater treatment.

Or

- (b) Write about the environmental legislation for water conservation.

12. (a) Write in detail about the methods for ground water infiltration.

Or

- (b) Discuss the equitable uses of water resources for sustainable growth and development.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FOURTH SEMESTER
Branch- Environmental Science
Paper-II-ENV. 402: REMOTE SENSING AND GIS
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks (Marks: 4x5=20)

1. Define Aerial photographs.
2. Write a brief note on SPOT.
3. Explain the optical sensors.
4. Describe the SAR operations.
5. Write a short note on agricultural applications of satellite.
6. Describe the types of GPS.
7. Explain the applications of GIS in desertification.
8. Give a brief note on EOS missions.

PART-B

Answer ALL questions .Each question carries 15 marks.(Marks: 4x15=60)

9. (a) Describe the mechanism of energy interaction with atmosphere.
Or
(b) Discuss the techniques and interpretation principles remote sensing.
10. (a) Write the general characteristics of sensors and scanners. How do you interpret the microwave data.
Or
(b) Write the basic principles of digital image processing. Explain biophysical modeling technique.
11. (a) Explain satellite data applications in water resource management and coastal zone changes.
Or
(b) Explain the applications of GIS in the areas of infrastructure and watershed management.
12. (a) Write the applications of remote sensing in industry mining and damage assessment.
Or
(b) Write the applications of GIS in integral earth observations studies and global changes.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FOURTH SEMESTER
Branch - Environmental Science

Paper-III-ENV.403 (A): ENVIRONMENTAL SAFETY(Generic Elective)
(Under CBCS)

Time:3 hour

Max. Marks:80

PART- A

Answer any FOUR questions. Each question carries 5 Marks

(Marks: 4x5=20)

1. Write a brief note environmental awareness.
2. Give brief account on benefits of EIA.
3. Briefly explain the impacts of population explosion.
4. Explain briefly about causes of noise pollution.
5. Write a brief note on natural resources.
6. Write a short note on use of alternate energy sources.
7. Briefly explain role of Government in the protection of the environment.
8. Write a brief note on impacts of cyclone.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Explain in detail scope and importance of environmental safety.
Or
(b) Write about the major conventions on biodiversity and their significance.
10. (a) Give an on family welfare programmers in India.
Or
(b) Write an essay on water pollution.
11. (a) Explain in detail renewable energy resources.
Or
(b) Give an account on causes and impacts of land degradation.
12. (a) Explain in detail prevention and control measures of pollution.
Or
(b) Write in detailed note on methods of disaster management.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FOURTH SEMESTER
Branch- Environmental Science
Paper –III-ENV. 403(B): DISASTER MITIGATION AND MANAGEMENT(Generic Elective)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks(Marks: 4x5=20)

1. Give a brief account on forecasting and warning system of natural disasters.
2. Discuss about cyclones.
3. Discuss briefly about pre disaster planning.
4. What are the legal aspects of disaster management?
5. Write about the community preparedness in natural disasters.
6. What is the role of NGO'S for disaster reduction?
7. Describe the purpose of risk analysis.
8. Explain the frame work for sustainable development.

PART-B

Answer ALL questions .Each question carries 15 marks.(Marks: 4x15=60)

9. (a) Define natural disasters? Explain the safety measures for natural disasters.
Or
(b) Describe the impact natural disaster on environment.
10. (a) Write the protection measures during disasters.
Or
(b) Explain the vulnerability analysis of disaster management.
11. (a) Give a detail on reduction and mitigation of natural disasters.
Or
(b) Explain the disaster preparedness and training.
12. (a) Write an essay on evaluation of accidents in industrial processes.
Or
(b) What are the basic concepts of risk analysis and assessment of natural disasters?

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FOURTH SEMESTER
Branch- Environmental Science
Paper –IV-ENV. 406 (A): FOREST RESOURCES AND MANAGEMENT (Open Elective)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks
4x5=30)

(Marks:

1. Give a brief account on Forest ecology.
2. Discuss the importance of Forest Resources.
3. Discuss briefly about the phytogeography.
4. Explain in brief about the Endemism.
5. Write about the Environmental organizations.
6. Describe the Environmental Conservation?
7. Give a brief note on Forest conservation.
8. Discuss briefly on mitigation measures of forest resources.

PART-B

Answer ALL questions .Each question carries 15 marks.

(Marks: 4x15=60)

9. (a) Define Resources? Explain the Forest Resources Management.
Or
(b) Explain the different communities in forest.
10. (a) Give an account on major plant communities of the world.
Or
(b) Explain the soil climates in India.
11. (a) Explain the role of ministry of Environment in India for conservation of forest.
Or
(b) Describe the International agency frame work on Environmental conservation.
12. (a) Give an account on emerging concepts in conservation of forest?
Or
(b) What are the researches needs to conserve forest resources of the world.

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
FOURTH SEMESTER
Branch- Environmental Science
Paper-IV- ENV.406 (B): GLOBAL ENVIRONMENTAL ISSUES (Open Elective)
(Under CBCS)

Time: 3 hours

Max. Marks: 80

PART- A

Answer any FOUR questions. Each question carries 5 Marks
4x5=20)

(Marks:

1. Write the effect of global warming on plants.
2. Write the various sources of Green house gases.
3. Explain the ozone layer depletion.
4. Write a short note on acid rain.
5. Describe the sources of radiations.
6. Give a brief note on disposal of radioactive wastes.
7. Explain the integrated land use planning.
8. Write a short note on recycling of waste.

PART-B

Answer ALL questions. Each question carries 15 marks

(Marks: 4x15=50)

9. (a) Write an essay on effect of global warming on hydrological cycle.
Or
(b) Explain the sources and sinks of green house gases.
10. (a) Explain the role of atmospheric pollutants in global climate changes.
Or
(b) Give a detail account on major air pollution episodes.
11. (a) Write an essay on radioactive isotopes and their applications.
Or
(b) Describe the radiation protection and control measures.
12. (a) Write in detail note on conservation of biological diversity.
Or
(b) Explain the updating environmental laws and new dimension to human towards environment.