FACULTY OF SCIENCE

SYLLABI

FOR

ENVIRONMENT AUDITING
ADD-ON COURSE

EXAMINATIONS 2012

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SYLLABUS OF ENVIRONMENTAL AUDITING  
(CERTIFICATE COURSE)

Paper 1 (Basic of Ecology)

THEORY

Ecology: The Concept and its significance in Environment, Ecology as a pluralistic Science

Environment: Components and functional aspects, Concept of Biosphere
   a) Hydrosphere
   b) Lithosphere
   c) Atmosphere

Ecosystem: Ecosystem concept, Dynamics, Energy flow, Food chains and food webs, Ecological pyramids, Structural and functional aspects of ecosystems, Disturbance and restoration of ecosystems.


Ecological Communities: Structure and composition of communities, Species interactions

Biogeochemical Cycles: Concept and some recent trends, Nitrogen, Carbon, Sulphur, Phosphorus and Hydrological Cycle.

Energy: Basics, Energy resources and consumption, efficiency and conservation.

Global pattern of Biodiversity: Biogeography and Biomes (concept and account of major terrestrial types) with special reference to Indian Biomes.

Conservation of Natural Resources: Renewable and Non-renewable resources. Conservation of the forests, water, air, soil, energy and minerals.

Biodiversity: Concept, Types, significance and uses of biodiversity. Biodiversity loss and methods of conservation.

Urban Ecology: City planning and environment, City as an environment system, Importance of treescape in the cities.

Introduction to environmental Audit: What is an Environmental Audit, Environment Monitoring; Bioindicators and Ecological indicator: Indicators of productivity, agriculture, climate, petroleum, pollution and overgrazing.

Elements of Environmental Audit: Concept of Environment Impact Assessment, Objective; Environment Impact Statement; Basic procedure adopted for Appraisal and Management Plan.

PRACTICAL

Vegetational Analysis: Quadrat method, Density, Dominance, Frequency,
Abundance and Importance Value Index, Ecological indicates.

**pH and Conductivity:** Analysis of different samples of water and soil.

**Bio-forms in Ecosystems:** Assessment and Analysis

**Study of food chains and ecological pyramids:** Organisms in the surrounding areas and their food chain pattern

**Paper-II Introductory Biology** (for students from Non-med. Stream)

**Variety of Life:**
Classification, Prokaryotes, Eukaryotes, Kingdoms: Viruses, Fungi, Protista, Plantae, Animalia; Taxonomy, Taxonomic hierarchy as introduced by Linnaeus, Species, Artificial and Natural Classification, **Speciation:** Selection- artificial and natural, Concept of species, Intra-specific speciation

**Water Relations:**
Absorption and movement of water in plants: Osmosis, Water potential, Solute potential, Pressure potential, Diffusion, Transpiration, factors affecting it; Ascent of Sap and its theories, Apoplastic and Symplastic pathway

**Mineral Relations/uptake:**
Mineral nutrition in plants- essential macro and microelements, their importance and deficiency symptoms.

**Adaptations:**
Morphological, Anatomical and Physiological adaptations of Xerophytes and Hydrophytes

**Autotrophic Nutrition:**
Grouping of organisms as per their carbon source, Photosynthesis-primary and secondary processes of photosynthesis, Chemosynthesis, C4 and CAM plants.

**Genetics:**
Classical genetics of Mendelian era, Mendel’s work, Chromosomal basis of inheritance, Variation and mutation.

**Pathology:**
Bacterial, Fungal, Viral diseases and physiological disorders in plants, their symptoms and means of control.

**Biotechnology:**
What is Biotechnology, its application in plant sciences and environment, Treatment of water, solid waste, organic slurries, remediation of soil and water.

**Chemicals of Life:**
Proteins, Carbohydrates, Lipids, Amino acids, Nucleic acids, Secondary products
**Evolution:**
Theories of origin of life, Natural selection, Modern views on evolution

**Health and Disease:**
Global distribution of diseases, Infectious diseases, Disinfectants, Sterilization and antiseptics, Cardiovascular diseases, Cancer, Ageing, Respiratory, Renal and Genetic diseases.

**Microbiology:**
Bacterial and Viral growth, Large scale production of useful microbes, Food and drinks, Enzymes technology and Biosensors.

**Biomedical Science:**
Drugs, their classification, use, abuse and hazards; Effects of drug use on humans ; Tobacco, Alcohol, Opiates, Cannabis, Sedatives, Cocaine, Amphetamines, LSD, addiction and de-addiction.

**Self–medication:**
Self- medication and its consequences, Rebound phenomenon, Steroids and its effects

**Biology of Aquatic and Terrestrial life:**
Marine and Fresh-water life forms, their characteristics and deviation from the terrestrial life forms. The life strategies in aquatic and terrestrial systems.

**Basic Source Books:**
*Biological Science by D.J. Taylor, N.P.O. Green and G.W. Stout; (Ed. R. Soper)*
*Cambridge Univ. Press, 1997*

**Practicals:** Related to the subject depending upon the facilities available

**Paper II**
**Introductory Mathematics** (for students from medical stream)

**Algebra:**
Binomial theorem, Permutation and combination, Mathematical induction

**Sets:**
Theory, Operation, Relations, Functions, Binary operations

**Equations:**
Quadratics equations with real coefficients

**Vectors:** Vectors and their application
**Calculus:**
Basic differential and integral calculus with working knowledge and its applications; Continuity and Differentiability, Application of dy/ dx; Integration- definite and indefinite and their properties

**Trigonometry:**
Trigonometric identities and functions

**Exponential and Logarithmic series**

**Practical/ Assignments:** Related to the subject matter.
(DIPLOMA COURSE)

Paper I: Geo–Environment

Maximum Marks: Theory 75 and Practical 25  
No of Lectures per week: 12  
No of Questions: 5 out of 8 to be attempted


Atmosphere: Different layers, their characteristics and temperature relationships; Atmospheric stability, Inversion and mixing heights, Windroses

Earth’s Processes and Geological Hazards: Earth’s processes concept of residence time and rates of natural cycles. Catastrophic geological hazards. Study of floods, landslides, earthquakes, volcanism and avalanches. Prediction and perception of the hazards and adjustments to hazardous activities.

Mineral Resources and Environment: Resources and reserves. Minerals and population. Oceans as new areas for exploration of mineral resources. Oceans and recycling of resources. Environmental impact of exploration, processing and smelting of minerals.


Land use planning: The land use plan. Soil surveys in relation to land-use planning. Methods of site selection and evaluation.

Environmental Geochemistry: Concept of Major, Trace and REE. Classification of trace elements, mobility of trace elements. Biogeochemical factors in environmental health. Human use, trace elements and health. Possible effects of imbalance of some trace elements. Diseases induced by human use of land.

Principles of remote sensing and its application in Environmental Sciences for auditing. Application of GIS in Environmental Management

Practicals:
- Soil survey in relation to land use:  
- Visit to different soil land-use sites;  
- Study of soil texture;
• Soil water holding capacity
• Soil pH
• Soil Conductivity
• Soil Elemental analysis
• One project related to any topic of the courses paper.

**Paper II: Pollution and Pollutants of Environment**

Maximum Marks: Theory 75 and Practical 25

No of lectures per week: 12
No of question: 5 out of 8 to be attempted


**Soil** : Physico-chemical properties, bacteriological sampling as analysis of soil quality. Soil Pollution control. Industrial waste effluents and heavy metals, their interactions with soil components. Soil micro-organisms and their function, Degradation of different insecticides, fungicides and weedicides in soil. Different kinds of synthetic fertilizers (N, P & K) and their interactions with different components of the soil.


**Marine** : Sources of marine pollution and control. Criteria employed for disposal of pollutants in marine system – Coastal Management.

**Biological** : Bio- pollutants- seeds, spores, bacteria, viruses, trichomes etc. Biological Warfare, Agricultural, Environmental and Human health hazards of *Parthenium*, *Ageratum* and *Lantana* weed and Eucalyptus tree Plantation.

**Microbial Pollutants and Sanitation** : Bacterial, Viral, Mycoplasmic pollutants interfering biological processes, man, plants and animals; Means of safety against them. Sanitation and hygiene.

**Practicals**
• Impact of pesticide/weedicides/pollutants on the seed germination, seed vigour and
seedling growth, cell division and cell respiration.

- Impact of inorganic and organic pollutants on seed germination, seed vigour and seedling growth, cell division and cell respiration.
- Impact of air pollutants on seed germination, seed vigour and seedling growth cell division and cell respiration.
- Phenology of Parthenium, Ageratum and Lantana weeds, Structure of trichome and seeds.
- Study of the structure of trichomes of Parthenium
- Impact of sewage on the cellular respiration of plants on seed germination, growth and cell respiration
- Analysis of water.
- Physico-chemical properties of sewage water samples.
(ADVANCED DIPLOMA)

Paper I: Environment Auditing and Management

- Introduction to Environment Auditing and Environmental Impact Assessment and Analysis
- Environmental Impact Statement & Environmental Management Plan
- Coastal Regulation Zone: CRZ Notification, 1991
- Notification of the Government of India, 2006; Various appendices and forms for application, Procedure of Environment Clearance-Screening, Scoping, Public Consultation, Appraisal Types of project activities requiring Environmental Clearance
- Checklist for Environment Audit
- Generic structure of EIA Document, Procedure of Public hearing, Composition of EAC, SEAC
- Impact assessment Methodologies Generalized approach to impact analysis and statement
- Baseline information and predictions
- Guidelines for Environment Audit & introduction to Environmental Planning
- Environmental Auditing procedure
- Matrix method and Batelle method of auditing.
- Restoration, rehabilitation and reclamation ecology concept.
- Urban and Rural planning and land-use pattern and policy for India
- Impact of Special Economic Zones on Environment.

Practical

1. Perform EIA on: Dam/Air post/Industry/Bridge/railway Track/Urban city/
2. Prepare an environmental audit of Hostel/ Institute/Industrial area/ City/Suburbs
3. Prepare a strategy for restoration of a degraded forest ecosystem
4. Illustrate a poorly-managed and well-managed ecosystem in your area/locality
5. Illustrate a land use pattern for a wasteland/roadsides/roundabouts.
6. Prepare a model showing sustainable development in a man-made ecosystem.
7. Collect a baseline data on vegetation in over-grazed grassland or any disturbed ecosystem

Paper-II Environmental Laws

- Environment Protection: Issues and problems; International and National efforts for protection.
- Provision of constitution of India regarding Environment (Article 48 A and 51(g))
- Environmental policy resolution, legislation: Public policy strategies in pollution control
- Wildlife Protection Act 1972 and Amended 1991
- Forest conservation Act 1980
- Indian Forests Act (revised) 1982
- Forest policy; Air (Prevention and Control of Pollution) Act, 1981
- The Water (Prevention and Control of Pollution) Act, 1974 as amended up to 1988 and rules 1975
- Scheme of labeling of environmentally friendly products (Ecomark).

**SUGGESTED READINGS**

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<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Publisher</th>
<th>Pages</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>Abbasai, S.A. &amp; Ramasami, E.</td>
<td>Biotechnological Methods of Pollution Control</td>
<td>Univ. Press(India) Ltd, Hyderabad</td>
<td>P.168</td>
<td>1999</td>
</tr>
<tr>
<td>Burroughs, W.I.</td>
<td>Climate Change –A Multidisciplinary Approach</td>
<td>Cambridge Univ. Press</td>
<td>P.298</td>
<td>2001</td>
</tr>
<tr>
<td>Cutler, S.L.</td>
<td>Environment Risks and Hazards</td>
<td>Prentice Hall of India</td>
<td>P.413</td>
<td>1999</td>
</tr>
<tr>
<td>De, A.K.</td>
<td>Environmental Chemistry</td>
<td>New Age International Pub</td>
<td>P.392</td>
<td>2000</td>
</tr>
<tr>
<td>Authors</td>
<td>Title</td>
<td>Publisher</td>
<td>Pages</td>
<td>Year</td>
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<tr>
<td>Enger &amp; Smith</td>
<td>Environmental Science</td>
<td>W.C. Brown</td>
<td>P.431</td>
<td>1995</td>
</tr>
<tr>
<td>Foskett, N. and Foskett, R.</td>
<td>Teach Yourself Conservation</td>
<td>Hodder &amp; Stoughton</td>
<td>P.248</td>
<td>1999</td>
</tr>
<tr>
<td>Harrison, R.M and de Mora, S.</td>
<td>Introductory Chemistry for the Environmental Sci. s</td>
<td>Cambridge Univ. Press</td>
<td>P 373</td>
<td>1996</td>
</tr>
<tr>
<td>Kapoor, B.S</td>
<td>Environmental Sanitation</td>
<td>S. Chand &amp; Sons, N.D</td>
<td>P.225</td>
<td>2000</td>
</tr>
<tr>
<td>Lomborg, B.</td>
<td>The Skeptical Environmentalist</td>
<td>Cambridge Univ. Press</td>
<td>P.515</td>
<td>1999</td>
</tr>
<tr>
<td>Lunine, J.I.</td>
<td>Earth</td>
<td>Cambridge Univ. Press</td>
<td>P.319</td>
<td>1974</td>
</tr>
<tr>
<td>Maini, M.S.</td>
<td>Ecology and Biogeography in India</td>
<td>Junk, The Hague</td>
<td></td>
<td>1996</td>
</tr>
<tr>
<td>Author(s)</td>
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<td>Nebal &amp; Wright</td>
<td>Environ. Sci.</td>
<td>PHI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ramakrishnan, P.S.</td>
<td>Ecology of Biological Invasion</td>
<td>NIE, New India</td>
<td>P.195</td>
<td>1989</td>
</tr>
<tr>
<td>Ramakrishnan, P.S.</td>
<td>Ecology and Sustainable Development</td>
<td>NBT, India</td>
<td>P.198</td>
<td>2001</td>
</tr>
<tr>
<td>Rao, C.R</td>
<td>Environ Pollution Control Engineering</td>
<td>Prentice hall of India</td>
<td>P.414</td>
<td>1999</td>
</tr>
<tr>
<td>Robinson, H.</td>
<td>Biogeography</td>
<td>ELBS, London</td>
<td></td>
<td>1982</td>
</tr>
<tr>
<td>Sutherland, W.J.</td>
<td>Ecological Census Techniques</td>
<td>Cambridge Univ. Press</td>
<td>P.336</td>
<td>1997</td>
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