

**SEMESTER COURSES FOR**  
**MASTER'S DEGREE PROGRAMME IN ENVIRONMENTAL SCIENCES**

The following courses of study are prescribed for the Ist, 2nd, 3rd & 4th Semesters of Master's Degree Programme in Environmental Sciences :-

**SEMESTER- I**

**Examinations to be held in**  
**Dec.,2009 ; Dec. 2010, and Dec. 2011**

Course No.	Title	Credit	%age of change
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**THEORY COURSES:-**

406	General Ecology	4	Less than 5%
407	Physical Environment	2	--- do ---
411	Aquatic Environment	4	New Course
412	Environmental Chemistry (New)	2	New Course
413	Remote Sensing (New)	4	New Course

**LABORATORY COURSES:-**

429	Lab. Course based on C.No.406 ,407 & 413	4	
430	Lab.Course based on C.No.411 & 412	4	

**SEMESTER- II**

**Examinations to be held in**  
**May,2010 ; May2011, and May 2012**

Course No.	Title	Credit	%age of change
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**THEORY COURSES :-**

451	Environmental Microbiology (New Course)	4	15%
455	Principles of Climatology (New course)	4	10%
456	Biometry	2	5%
457	Computer Applications (New course)	2	10%
458	Natural Resources:Conservation & Management	4	New Course

**LABORATORY COURSES :-**

478	Lab.Course based on C.No. 451 ,458 & 455.	4	
479	Lab.Course based on C.No.456 & 457	4	

### SEMESTER-III

Examinations to be held in  
Dec.,2010 ; Dec., 2011 and Dec. 2012

Course No.	Title	Credit	%age of change
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#### THEORY COURSES:-

500	Wildlife Ecology	4	10%
505	Env. Impact Assessment & Management	4	New Course
506	Env. Pollution. Hazards & Control	4	New Course
507	Environmental analysis & Instrumentation	2	New Course
508	Ecotoxicology	2	New Course

#### LABORATORY COURSES :-

528	Lab. Course based on C.No.500 & 505	4
529	Lab. Course based on C.No.506, 507 & 508	4

### SEMESTER-IV

Examinations to be held in  
May,2011 ; May2012, and May 2013

Course No.	Title	Credit	%age of change
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#### THEORY COURSES :-

552	Environment & Law	4	40%
558	Basic course in Environmental Economics	2	10%
559	Environmental Biotechnology	2	New Course
560	Environmental Health Hazards & Sanitation	4	New Course
561	Disaster Management	4	New Course

#### DISSERTATION :-

576	M.Sc.Dissertation in lieu of Lab. Course	8
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**Detailed Syllabus**  
**Semester - I**

Course No. : 406  
Credits : 4

Title : General Ecology  
Max. Marks: 100  
(a) Semester Examination : 80  
(b) Sessional Assessment : 20

Duration of Examination : 3 Hrs.

**Syllabus for the examinations to be held in**  
**Dec.,2009; Dec.,2010 & Dec.,2011.**

**OBJECTIVES :**

The purpose of the course is to make the students to understand various ecological principles and factors that determine the size and number of population that can co-exist within a specific area. This knowledge is crucial for better development and management of natural resources and global environment.

**UNIT - I : INTRODUCTION TO ECOLOGY AND ECOSYSTEM**

- 1.1 Ecology- its subdivisions, scope and relation with other life sciences.
- 1.2 Ecological factors- physical factors (water, light, temperature).
- 1.3 Ecological factors - Edaphic (Soil) and topographic factors.
- 1.4 Ecosystem - Concept, components and characteristics.
- 1.5 Ecosystem development and concept of climax.

**UNIT -II : ECOSYSTEM STUDY**

- 2.1. Laws of Thermodynamic and generalized model of energy flow through an ecosystem.
- 2.2. Primary productivity and methods of its measurements.
- 2.3. Secondary productivity (concept), Law of minimum and Law of tolerance
- 2.4. Food chain, foodwebs & ecological pyramids
- 2.5. Ecological indicators of environmental factors.

**UNIT -III : BIOTIC COMMUNITY - PRINCIPLES AND CONCEPTS**

- 3.1. Concept of biotic community.
- 3.2. Intra community - classification & the phenomenon of ecological dominance.
- 3.3. Community Analysis.
- 3.4. Species diversity within community.
- 3.5. Patterns in communities.

**UNIT - IV : POPULATION CHARACTERISTICS & DYNAMICS**

- 4.1. Group properties (Intra specific interactions).
- 4.2. Attributes of population - density, natality and mortality.
- 4.3. Age distribution.
- 4.4. Population growth vis-a-vis the concept of carrying capacity.
- 4.5. Density as a factor in regulating population - density independent and density dependent factors.

**UNIT-V : POPULATION REGULATION STRUCTURE AND INTERACTION**

- 5.1. Population dispersal.
- 5.2. Population structure.
  - (a) Internal Distribution Patterns.
  - (b) Aggregation and Allee's principle.
  - (c) Isolation and territoriality.
- 5.3. Interaction within population.
  - (a) Negative Interactions - Interspecific competition, predation, parasitism, antibiosis .
  - (b) Positive Interactions - Commensalism, Co-operation, mutualism.

- 5.4. Population Behaviour.
  - (a) Basic behaviour patterns.
  - (b) Regulatory and compensatory behaviours.
  - (c) Social behaviour.
- 5.5. Character Displacement - Sympatry and allopatry.

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total TEN questions in all) and the candidate will be required to answer ONE QUESTION from each unit (total questions to be attempted will be FIVE) i.e. there will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Benton, A.H. And Werner, W.E. (1976). Field Biology and Ecology. Tata Mc.Graw Hill Publishing Company Ltd. New Delhi.
2. Chapman, J.L. And Reiss, M.J.(1995). Ecology- Principles and applications.
3. Claude Fauric; C.Ferra; Medori, P. & Devaux, J. (2001). Ecology. Sciences & Practice. Oxford & IBH Pub. Co. Pvt. Ltd. (N. Delhi).
4. Dash, M.C. (1993). Fundamentals of Ecology. Tata Mc.Graw Hill Publishing Company Ltd. New Delhi.
5. Kormondy, E.J. (1986). Concept of Ecology. Prentice Hall of India, New Delhi.
6. Odum, E.P. (1996). Fundamentals of Ecology. Natraj Publishers, Dehradun.
7. Southwick, H.C. (1972). Ecology & Quality of our Env.. Van No. Strand Reinhold Company, New York.

**Detailed Syllabus**  
**Semester - I**

Course No. : 407 (New Course)  
Credits : 2

Title :Physical Environment  
Max. Marks: 50  
(a) Semester Examination : 40  
(b) Sessional Assessment : 10

Duration of Examination : 2 Hrs.

**Syllabus for the examinations to be held in**  
**Dec.,2009; Dec.,2010 & Dec.,2011.**

**OBJECTIVES :**

This course is designed to fulfill the needs of students of environmental sciences in understanding the internal structure of Earth and various geomorphological processes as well as systems responsible for the formation and modification of landforms on the Earth. This would also serve as a base for different applied aspects of environmental science e.g. GIS & remote sensing, disaster management and environmental impact assessment and management.

**UNIT - I : INTERIOR OF EARTH**

- 1.1 Types of seismic waves and their role in the study of Earth's interior.
- 1.2 Different zones in the Earth's interior and their composition.
- 1.3 The Earth's Magnetic Field - Magnetic reversal and magnetic anomaly.
- 1.4 Continental Drift Theory.
- 1.5 Theory of isostasy and global isostatic adjustment.

**UNIT-II : GEOMORPHOLOGICAL PROCESSES**

- 2.1 Rock cycle, Introduction to major rock types.
- 2.2 Folds and faults, major types of folds and faults.
- 2.3 Physical weathering, chemical weathering and their types.
- 2.4 Controlling factors in mass wasting; types of mass wasting.
- 2.5 Volcanism - Components and types of volcanoes, volcanic materials, process and effects of volcanism.

**UNIT-III : GEOMORPHOLOGICAL SYSTEMS**

- 3.1 Factors affecting landform development.
- 3.2 Fluvial system - Factors affecting stream erosion and deposition, erosional and depositional landforms.
- 3.3 Underground water system - Water table, landforms formed by ground water action.
- 3.4 Aeolian system - Mechanism of wind erosion, erosional and depositional landforms.
- 3.5 Glacial system - Mechanism of glacial erosion, erosional and depositional landforms.

**NOTE FOR PAPER SETTER:**

The question paper will contain TWO QUESTIONS from each unit (Total SIX questions in all) and the candidate will be required to answer ONE QUESTION from each unit (total questions to be attempted will be THREE) i.e. there will be internal choice within each unit.

**LITERATURE RECOMMENDED :****(A) Books :-**

1. Cooke, R.U. and Doornkamp, J.C. (1974). Geomorphology in Environmental Management- An Introduction, Clarendon Press, Oxford, U.K.
2. Easterbrooke, D.J. (1969). Principles of Geomorphology. McGraw Hill, New York.
3. Keller, E.A. (1999). Introduction to Environmental Geology. Prentice Hall, New Jersey.
4. Press, F. and Siever. R. (1994) .Understanding Earth. W.H. Freeman & Co., U.S.A.
5. Ritter, D.F.; Kochel, R.C. and Miller, J.R. (1995). Process Geomorphology. Wm. C. Brown Publishers, U.S.A.
6. Singh, S. (2000). Physical Geography. Prayag Pustak Bhawan, Allahabad.
7. Smithson, P.; Addison, K. and Atkinson, K. (2002). Fundamentals of the Physical Environment . Routledge Publishers, London.
8. Strahler, A.H. and Strahler, A.N. (1992). Modern Physical Geography. John Wiley & Sons, New York.
9. Wild, R. (1993). The Earth Care Annual. National Wildlife Federation, Rodale Press, Pennsylvania.

**(B) Web Sites :-**

1. <http://www.pbs.org/wnet/savageearth/>
2. <http://www.usgs.gov/network/science/earth/earth.html/>

## Detailed Syllabus Semester - I

Course No.: 411  
Credit : 4

Title: Aquatic Environment  
Max. Marks : 100  
a) Semester Examination: 80  
b) Sessional Assessment : 20

Duration of Examination : 3 Hrs.

### Syllabus for the examinations to be held in Dec.,2009; Dec.,2010 & Dec.,2011.

#### **OBJECTIVES :**

The present course has been designed to provide information on various aspects of aquatic environment, changing physico-chemical profile, biotic characteristics and applicability of the information for the exploitation of such water resources and also for their better management and conservation.

#### **UNIT-I: AQUATIC ENVIRONMENT, HYDROLOGY AND HYDRAULICS**

- 1.1 Indian water resources and their status.
- 1.2 Hydrological cycle and Global Water Balance
- 1.3 Runoff: factors affecting runoff.
- 1.4 Measurement of runoff, stream gauging, stream hydrograph.
- 1.5 Properties of fluids: introduction: hydraulics, properties (density, specific weight, specific volume, specific gravity and compressibility), types of fluids.

#### **UNIT-II: WETLANDS AND RAMSAR CONSERVATION**

- 3.1 Ramsar's role in water resource management.
- 3.2 Integrated framework for wetland inventory, assessment and monitoring.
- 3.3 Ramsar framework for wetland inventory: core data fields for inventory of biophysical and management features of wetlands.
- 3.4 Wetland Assessment.
- 3.5 Wetland Monitoring.

#### **UNIT-III: LOTIC AND LENTIC ENVIRONMENT**

- 2.1 Lakes: Origin and Classification.
- 2.2 Stratification: thermal and chemical
- 2.3 Springs: origin, importance and classification
- 2.4 Physical characteristics of Lakes, rivers and springs
- 2.5 Chemical characteristics of Lakes, Rivers and Springs.

#### **UNIT-IV: AQUATIC ORGANISMS.**

- 4.1 Ecological classification of fresh water organisms.
- 4.2 Plankton: importance and management.
- 4.3 Macrophytes: importance, classification and management.
- 4.4 Aquatic organisms- Fishes, importance, causes of their depletion & conservation.
- 4.5 Aquatic birds: Importance and causes of their depletion.

#### **UNIT-V: CONSERVATION AND MANAGEMENT**

- 5.1 National Water Policy
- 5.2. Causes for dwindling of fresh water resources.
- 5.3 Water conservation.
- 5.4 Ramsar framework for wetland management.
- 5.5 Development of National Wetland Policy (as per Ramsar convention).

**NOTE FOR PAPER SETTER:**

The question paper will contain TWO QUESTIONS from each unit (Total Ten Questions in all) and the candidate will be required to answer ONE QUESTION from each unit (Total questions to be attempted will be FIVE) i.e. there will be internal choice within each unit.

**LITERATURE RECOMMENDED**

1. Wetzel, R. G. (2002). Limnology Lakes and River Ecosystem. Academic Press, London.
2. Schwoerbel, J. (1991). Handbook of limnology. Scientific publ. Jodhpur.
3. Goldman, C. R. and Horne, A. J. (1994). Limnology. Mc. Graw Hill Int. Book Co., New Delhi.
4. Hutchinson, G. E. (2004). Treatise on Limnology. Vol. I, part-2, Vol. II. John Willey and Sons, New York.
5. Jhingran, V. G. (1992). Fish and Fishes of India. Hindustan Publishing Corporation, India.
6. Aggarwal, S. C. (1999). Limnology. APH Publ. Corp., New Delhi.
7. Garg, S. K. (1998). Hydrology and water resources engineering. Khanna Publishers, Delhi.
8. Bal, A.S (2005). An Introduction to Environment Management. Himalaya Publishing House, Mumbai.
9. India's Wetlands Mangroves and Coral Reefs (1992). WWF India.
10. Dugan, P. (1993). A Mitchell Beazley World Conservation Atlas. Wetlands in Danger. Mitchell Beazley, London.
11. Abbasi, S. A. (1997). Wetlands of India. Discovery Publishing House. New Delhi.
12. Sinha, P. C. and Mohanty, R. (2002). Wetland Management Policy and Law. Kanishka Publishers, Distributors, New Delhi.

**Detailed Syllabus**  
**Semester - I**

Course No.: 412

Title: Environmental Chemistry  
(New Course)

Credit : 2

Max. Marks : 50

- a) Semester Examination: 40
- b) Sessional Assessment : 10

Duration of Examination : 2 Hrs.

**Syllabus for the examinations to be held in**  
**Dec.,2009; Dec.,2010 & Dec.,2011.**

**OBJECTIVES :**

This course has been designed to acquaint students with natural chemical constituents of the environment, the interactions between them and manner in which changes are brought about due to human interference, particular pollution.

**UNIT-I:**

- 1.1 Concept and scope of Environmental Chemistry - Pollutant, Contaminant, Receptor, Sink, Pathways of a pollutant, Speciation, Threshold limit value, Stoichiometry, Gibb's energy.
- 1.2 Composition of atmosphere and atmosphere structure.
- 1.3 Cycling of primary gaseous pollutants and chemistry of methane cycle.
- 1.4 Chemical and photochemical reactions in atmosphere.
- 1.5 Chemistry of ozone and alternatives for CFC's.

**UNIT-II:**

- 2.1 Chemistry of water: Acid base equilibria, pH and buffers, oxidation-reduction, redox potential, ionization.
- 2.2 Concept of DO, BOD, COD, Sedimentation, Coagulation, filtration.
- 2.3 Inorganic and organic components of soil.
- 2.4 Introduction to Radiochemistry- $\alpha$   $\beta$   $\gamma$  radiations, nomenclature and classification of nuclides.
- 2.5 Applications of radioisotopes in agriculture and industry.

**UNIT-III:**

- 3.1 Toxic chemicals in the Environment.
- 3.2 Enzyme inhibition.
- 3.3 Microorganisms-the catalyst of aquatic reaction.
- 3.4 Chemistry of chloro organic compounds such as DDT, Lindane, Polychlorinated derivative of cyclo pentadiens and Polychlorinated biphenyls.
- 3.5 Long term effects of chloro-organic compounds.

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total Six Questions in all) and the candidate will be required to answer ONE QUESTION from each unit (Total questions to be attempted will be THREE) i.e. there will be internal choice within each unit.

**LITERATURE RECOMMENDED**

1. Baird, C (2000). Environmental Chemistry. W. H. Freeman and Company, USA.
2. De, A. K. (2003). Environmental Chemistry. New Age International Ltd., New Delhi.
3. Eisenbund, M. and Gesell, T. (1997). Environmental Radioactivity-from natural, industrial and military sources. Acad. Press, USA.
4. Mido, Y. and Satake, M. (1995). Chemicals in the environment. Discovery Pub. House, New Delhi.
5. Harrison, R. M. and Mora, S. J. De. (1996). Introductory chemistry for the Environmental Chemistry. Cambridge University, Press.
6. Girard, J. E. (2005). Principals of Environmental Chemistry. Jones and Bartlett Publishers, Inc.
7. Sodhi, G. S. (2006). Fundamental concepts of environmental chemistry. Narosa Publishing House, New Delhi.
8. Sharma, B. K. (2001). Environmental Chemistry. Krishna Prakashan Media Pvt. Ltd. Meerut.

**Detailed Syllabus**  
**Semester - I**

Course No. 413

Title : Remote Sensing & its  
Applications(New)

Credit : 4

Max. Marks: 100

a) Semester Exam. : 80

b) Sessional Assessment : 20

Duration of Examination: 3 hours

**Syllabus for the examinations to be held in**  
**Dec. 2009, Dec. 2010 and Dec.2011**

**OBJECTIVES :**

Remote Sensing Technology has developed remarkably as an important tool for scientific management of resources & environment. The technology improves our understanding of both global & local environments & to map & monitor changes in these environment. Remote Sensing application for natural/physical resources assessment, is helpful to improve our ability to achieve the goal of optimum land use planning & in turn sustainable resource management & development. This course has been designed with the objectives to acquaint the students with basic remote sensing principles, concepts & their applications in various fields.

**UNIT -1 : INTRODUCTION TO REMOTE SENSING AND REMOTE SENSING SYSTEMS**

- 1.1 Remote sensing: Definition, Concept of Electromagnetic radiation (EMR); Electromagnetic Spectrum; Radiation principles, Scope of remote sensing
- 1.2 EMR interaction with Atmosphere & Terrain
- 1.3. Platforms and Sensors: Classification of Platforms, Basic Characteristics of Sensors and Spatial, Spectral, Temporal, Radiometric resolutions
- 1.4 Remote sensing systems: Framing and Scanning Systems
- 1.5 Introduction to IRS, LANDSAT - 5, 7 and SPOT - 4, 5, IKONOS, NOAA, INSAT, satellites and sensors

**UNIT -2 : AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY**

- 2.1 Aerial Photography-I: Definition, Basic information, Specifications for Planning and execution of aerial photography.
- 2.2. Aerial Photography- II: Types of aerial photographs & information recorded on aerial photographs.
- 2.3. Brief information about Tilt, Swing, overlap of aerial photographs.
- 2.4. Fundamentals of photogrammetry I: Taking measurements from aerial photographs i.e. Scale of aerial photographs, distance, area.
- 2.5 Fundamentals of photogrammetry II: Stereovision, Stereoscopes, Measurement of height of objects by Parallax method.

**UNIT -3 : MICROWAVE AND THERMAL REMOTE SENSING, GIS**

- 3.1 Microwave Remote Sensing I : Introduction, advantages, Active remote sensing components, Radar Operating Principles, Spatial resolution in RADAR, SLAR, SAR, Space borne RADAR
- 3.2 Microwave Remote Sensing II: RADAR return, image Characteristics & interpretation of radar images
- 3.3 Thermal Remote Sensing: Concept, Thermal Infrared Radiation properties, application of Thermal infrared remote sensing
- 3.4 Geographical Information System (GIS)- I: Definition, Components of GIS, Geographical data & database structures.
- 3.5 Geographical Information System (GIS)- II:, Spatial data models viz. raster and vector, Data input & output in GIS.

**UNIT -4 : IMAGE INTERPRETATION**

- 4.1 Visual Interpretation of aerial photographs & Satellite images
- 4.2 Digital Image Processing: Digital Image & image structure, hardware and software requirements for digital image processing.
- 4.3 Image restoration: Radiometric and geometric errors and their corrections
- 4.4 Image enhancement: Contrast, Contrast enhancements- linear and non linear, edge enhancement.
- 4.5 Information Extraction: Principal component analysis, Image classification- unsupervised and supervised, change detection.

**UNIT -5 REMOTE SENSING & GIS APPLICATIONS**

- 5.1 Remote sensing & GIS application in Forestry
- 5.2 Remote sensing & GIS application in Ecology & Environment.
- 5.3 Remote sensing & GIS application in Agriculture, Soil survey and soil mapping
- 5.4 Remote sensing & GIS application in Land use/ land Cover & land evaluation.
- 5.5 Remote sensing & GIS application in Disaster Management.

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total Ten Questions in all) & the candidates shall be required to answer ONE QUESTION from each unit (Total questions to be attempted will be FIVE) i.e. there will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Burrough, P.A. (1986). Principles of Geographical Information System for Land Resource Assessment. Oxford Univ. Press.
2. Curran, P.J. (1988). Principles of Remote Sensing, ELBS, Longman Inc.
3. Jensen, J.R. (1986). Digital Image Processing. Prentice Hall, New York.
4. Jensen, J. R. (2003). Remote Sensing of the Environment, Pearson Education, Singapore.
5. Lillesand T.M. & Kiefer R.W. (1987). Remote Sensing & Image Interpretation. Second Ed. John Wiley & Sons, New York.
6. Rao, U.R. (1996). Space Technology for Sustainable development, Tata McGraw Hills Co. Ltd., New Delhi.

**Detailed Syllabus**  
**Semester - II**

Course No. : 451

Title : Environmental Microbiology  
(New Course)

Credits : 4

Max. Marks: 100

(a) Semester Examination : 80

(b) Sessional Assessment : 20

Duration of Examination : 3 Hrs.

**Syllabus for the examinations to be held in**  
**May, 2010; May, 2011 and May, 2012**

**OBJECTIVES :**

The main objective of this course is to make the students familiar with micro organisms without which human could not survive as these microbes occur in large number in most natural environment and bring about many desirable and undesirable changes. Beside their role in evolution of life on this planet, the microbial activity is linked directly with processing and removal of dead bodies and sewage. Thus , their role as scavengers is encouragable. The study of this course will help the students to develop the sustainable environment.

**UNIT -I : INTRODUCTION AND HISTORY OF MICROBIOLOGY**

- 1.1 History and scope of microbiology
- 1.2 Branches of microbiology
- 1.3 Preparation of Media for Isolation and culture of Microorganisms
- 1.4 Sterilization techniques used in Microbiology
- 1.5 Nature of virulance, toxins, extra cellular enzymes of pathogenic bacteria

**UNIT -II : MICROBIAL ENVIRONMENT**

- 2.1 Nature and function of micro-organisms in soil
- 2.2 Nature and function of micro-organisms in air
- 2.3 Microbes and Biogeochemical cycles - Carbon cycle, Sulphur cycle, Nitrogen cycle, Phosphorus cycle and iron cycle
- 2.4 Aquatic Microbiology - Microbes of marine , fresh water & polluted environment
- 2.5 Potability of water - Microbial assessment of water quality

**UNIT - III : FOOD MICROBIOLOGY**

- 3.1 Initial contamination and microbial spoilage of food
- 3.2 Sources and types of microbes in milk
- 3.3 Pasteurization of milk
- 3.4 Preservation and dehydration of food
- 3.5 Fermented foods : Vegetables and dairy products

**UNIT - IV : INDUSTRIAL MICROBIOLOGY**

- 4.1 Types of fermentation process
- 4.2 Alcoholic fermentation
- 4.3 Production of vinegar, lactic acid and citric acid
- 4.4 Production of antibiotics, amino-acids, vitamins, vaccines, steroid transformation
- 4.5 Microorganisms in Bioassays

**UNIT - V : DEVELOPMENTS IN ENVIRONMENTAL MICROBIOLOGY**

- 5.1 White - rot fungal (WRF) technology for treatment of hazardous wastes.
- 5.2 Bioremediation - concept, types, advantages and disadvantages.
- 5.3 In-situ bioremediation
- 5.4 Bioventing and Air sparging
- 5.5 Alternate electron acceptors technology and Bioaugmentation

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (total TEN questions) and the candidate will be required to answer ONE QUESTION from each unit (total questions to be attempted will be FIVE) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Agarwal, I.K. and I.K. Nene (1985). Seed borne diseases of field crops and their control. Publication and information Division, I.C.A.R.
2. Agrios, G.N. (1988). Plant Pathology, Acad Press, Inc.
3. Alexander, M. (1983). Soil Microbiology, Wiley Eastern Limited.
4. Frazier, W.C. and D.C. Westheff (1978). Food Microbiology, TATA McGraw Hill Pub. Co. Ltd.
5. Frobisher, M.R.D., Hinsdill, K.T. Crabtree, C.R. Goodheart (1974). Fundamentals of Microbiology, W.B. Saunders Company.
6. Hinchee, R.E. And Olfenbuttel, R.F. (1991). *In Situ* Bioreclamation : Applications and Investigations for Hydrocarbons and Contaminated Site Remediation. Butterworth - Heinemann, U.S.A.
7. Meyers, R.A. (1999). Encyclopedia of Environmental Pollution and Cleanup. 2. John Wiley & Sons, U.S.A.
8. Pelzcar, M.J.; Reid, R.D. & E.C.S. Chan (1977). Microbiology. MCGRAW Hill, New York.
9. Schlegel, H.G. (1985). General Microbiology, Cambridge University Press
10. Shukla, S.B. And Shantharam (2000). General Microbiology. Oxford & IBH Publishing Co. Ltd. N. Delhi.
11. Stainer, R.Y.; J.L. Ingraham; M.L. Wheels and P.R. Painter (1995). General Microbiology. McMillan Press Hong Kong.
12. Subha Rao, N.S. (1986). Soil Micro-Organisms and Plant growth. Oxford and IBH Pub. Co.
13. Tortora, G.J.; Funke, B.R. & Case, C.L. (1995). Microbiology - An Introduction. The Benjamin / Cummings Pub. Co., USA.

**Detailed Syllabus**  
**Semester -II**

Course No. : 455

Credits : 4

Duration of Examination : 3 Hrs.

Title : Principles of Climatology  
(New Course)

Max. Marks: 100

(a) Semester Examination : 80

(b) Sessional Assessment : 20

**Syllabus for examinations to be held in**  
**May, 2010; May, 2011 and May, 2012**

**OBJECTIVES :**

Climatology describes the long-term pattern of weather in a particular area. Climates often undergo cyclic changes over decades, centuries and millennia. Determining where we are in these cycles and predicting what may happen in the future is an important, but difficult process. As foolproof predictions of environmental futures may be an unattainable goal, but by a better understanding of environmental processes and systems, we shall be better prepared to manage the physical environment sympathetically and to respond to foreseen and unforeseen environmental changes. In this context, the present course describes the basic concepts of climatology and their applications in weather forecasting and immediate human environments.

- UNIT - I :**
- 1.1 Definition, sub-divisions and scope of climatology.
  - 1.2 Composition and structure of the atmosphere.
  - 1.3 Insolation; Factors governing insolation.
  - 1.4 Heat budget of the Earth.
  - 1.5 Factors determining horizontal distribution of temperature.
- UNIT - II :**
- 2.1 Factors controlling pressure, horizontal distribution of pressure.
  - 2.2 Factors controlling wind .
  - 2.3 Wind system; Types of planetary winds.
  - 2.4 Local winds and types.
  - 2.5 Measurement of wind, air temperature and insolation.
- UNIT - III :**
- 3.1 Air masses , air fronts and their types.
  - 3.2 Climatic classification- Basis of classification; Koeppen's classification.
  - 3.3 Thornthwait's classification- 1931 scheme, 1948 scheme.
  - 3.4 Weather Forecasting - Tools in weather forecasting .
  - 3.5 Weather Forecasting in India.
- UNIT - IV :** Climate of the world : Describing the climatic features and native vegetation of the following :
- 4.1 Equatorial
  - 4.2 Savanna
  - 4.3 Hot Desert
  - 4.4 Mediterranean
  - 4.5 Steppe
- UNIT - V :**
- 5.1 Hazards - Fog and thunderstorm.
  - 5.2 Effect of climate on vegetation.
  - 5.3 Bioclimatology- Climate and Human Health
  - 5.4 Climate and House types.
  - 5.5 Climatic change-Indicators of past climate, Carbon dioxide theory, Volcanic dust theory.

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (total TEN questions) and the candidate will be required to answer ONE QUESTION from each unit (total questions to be attempted will be FIVE) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :****(A) Books :**

1. Cunningham, W.P. and Saigo, B.W. (1999). Environmental Science - A Global Concern WCB McGraw-Hill, U.S.A.
2. Emiliani, C. (1992). Planet Earth. Cambridge University Press, U.K.
3. Fellmann, J.; Getis, A. and Getis, J. (1996). Human Geography-Landscapes of Human activities. WCB McGraw-Hill, USA.
4. Houghton, J. (1997). Global Warming - The complete Briefing. Cambridge Univ. Press, U.K.
5. Lean, G. & Hinrichsen, D. (1994). Atlas of the Environment. Harper Perennial Pub., New York.
6. Lundgren, L. (1986). Environmental Geology. Prentice Hall, New Jersey.
7. Lunine, J.I. (1999). Earth-Evolution of a Habitable World. Cambridge Univ. Press, U.K.
8. McKnight, T.L. (1993). Physical Geography-A Landscape Appreciation. Prentice Hall, New Jersey.
9. Pearce, F. (1989). Climate and Man - From the Ice Ages to the Global Greenhouse. Ivison Books, London.
10. Rogers, J.J.W. and Feiss, P.G. (1998). People and the Earth - Basic Issues in the Sustainability of Resources and Environment. Cambridge University. Press, U.K.
11. Smithson, P.; Addison, K. and Atkinson, K. (2002). Fundamentals of the Physical Environment. Routledge Publishers, London.
12. Wellburn, A. (1996). Air Pollution and Climate Change- The Biological Impact. Longman Publishers, Singapore.

**(B) Web Sites :**

1. <http://ecosys.drdr.virginia.EDU:80/atm.html/>
2. <http://www.islandnet.com/~skies/>

**Detailed Syllabus**  
**Semester - II**

Course No. : 456  
Credits : 2

Title : Biometry  
Max. Marks: 50  
(a) Semester Examination :40  
(b) Sessional Assessment : 10

Duration of Examination : 2 Hrs.

**Syllabus for the examinations to be held in**  
**May,2010 ; May2011, and May2012**

**OBJECTIVES :**

Biometrics helps the biologists to understand the nature of variability and to assess and represent it quantitatively. The course is designed to help the students to make statistical calculations to present the result in more meaningful manner.

- UNIT - I :**
- 1.1 Importance and scope of biometry.
  - 1.2 Sampling of data - random and non-random sampling.
  - 1.3 Diagrammatic (Line, bar, pie diagram) and Graphic (Histogram, frequency polygon, frequency curve, cumulative frequency curve) representation of data.
  - 1.4 Measures of central tendency - Mean(AM,GM &HM), Mode & Median.
  - 1.5 Measures of dispersion; skewness & kurtosis
- UNIT -II :**
- 2.1 Probability distribution - Binomial distribution.
  - 2.2 Poison distribution.
  - 2.3 Normal distribution.
  - 2.4 Test of hypothesis, two types of errors.
  - 2.5 T-Test for assumed population mean and comparison of two samples.
- UNIT -III:**
- 3.1 Chi square test and its application.
  - 3.2 Co-relation and regression.
  - 3.3 Principles of design of experiments. Examples of CRD and RBD.
  - 3.4 One way analysis of variance.
  - 3.5 Two way analysis of variance

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (total SIX questions) and the candidate will be required to answer ONE QUESTION from each unit (total questions to be attempted will be THREE) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Gupta, S.C. (1999). Fundamentals of Statistics. Himalayan Pub. House Delhi.
2. Hoshmand, A.R.(1988).Statistical methods for Env.& Agr. Science. CRS Press, New York
3. Khan,I.A. & Khanum,A. (1994). Biostatistics. Ukaaz Publications, Hyderabad.
4. Rao,P.S.S. & Richard, J.(1996). An Introduction to Biostatistics. Prentice Hall, New Delhi.
5. Sukhatma, P.Iii. and Amble,Iii.N. (1976). Statistical methods for Agricultural workers : ICAR, New Delhi.

**Detailed Syllabus**  
**Semester - II**

Course No. : 457  
Credits : 2

Title : Computer Applications  
Max. Marks: 50  
(a) Semester Examination : 40  
(b) Sessional Assessment : 10

Duration of Examination : 2 Hrs.

**Syllabus for the examinations to be held in**  
**May,2010 ; May2011, and May2012**

**OBJECTIVES :**

The Present course has been designed with the objective to provide the basic knowledge about the computer and performing various statistical calculations easily to present the result in a more meaningful manner.

- UNIT -I :**
- 1.1 Computer components & its types.
  - 1.2 Computer terms & Number system (Binary to decimal & vice-versa).
  - 1.3 Computer memory & its types.
  - 1.4 Secondary storage device FD/HD.
  - 1.5 Algorithms & Flowcharts.
- UNIT -II :**
- 2.1 UNIX Operating system & its features, Windows.
  - 2.2 Internal & External commands of DOS & its functions.
  - 2.3 Language types & features.
  - 2.4 Types of Networks, data transmission methods, communication protocols
  - 2.5 Internet, World Wide Web.
- UNIT III :**
- 3.1 Features of C, datatypes, constants, variables.
  - 3.2 Operators, Library functions.
  - 3.3 Conditional & Control statements.
  - 3.4 I/O statements, arrays (One dimensional).
  - 3.5 Functions , String functions.

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (total SIX questions) and the candidate will be required to answer ONE QUESTION from each unit (total questions to be attempted will be THREE) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Balagurusamy, E. (1995). Programming with C. Tata McGraw Hil Pub., New Delhi.
2. Jain, P.K. (1995). Fundamentals of Computers . BPB Pub., New Delhi.
3. Kanetkar, Y. (1998). Exploring in C. BPB Pub., New Delhi.
4. Rajaraman, Iii. (1989). Fundamentals of Computers . PHI Pub., New Delhi.
- 5 Schaum Series (1992). Programming in C : Tata McGraw Hil Pub., New Delhi.
6. Sharma, A.K. (1996). Computer Science. Dhanpat Rai & Sons, New Delhi.
7. Sinha, P.K. (1995). Computer Fundamentals. BPB Pub., New Delhi
8. Jamwal, S.S. (2009) Executing C - a practical approach , Saksham Books International .

## Detailed Syllabus Semester - II

Course No. 458

Credit : 4

Duration of Exam.: 3 hours

Title : Natural Resources :  
Conservation & Management

Max. Marks: 100

(a) Semester Exam. : 80

(b) Sessional Assessment : 20

### Syllabus for the examinations to be held in May, 2010; May, 2011 and May, 2012

#### OBJECTIVES :

The Natural resources of ecosphere are being wastefully consumed at an increasing rate under the combined effect of population explosion & industrialization. The current rate of usage takes absolutely no account of real size of available reserves of natural resources. The needs of future are greatly ignored. In addition to this, malnutrition is fast spreading in most countries of the world, including India. Even advanced countries will no longer be protected from shortages of Natural resources. The course is designed to provide information to the students about the natural resource of this planet, the causes of their depletion & their conservation & management for future use.

#### **UNIT -I : NATURAL RESOURCES - PLANTS**

- 1.1 Natural resources: introduction, characteristics & classification.
- 1.2 Concept of endemic, extinct and threatened species (endangered, rare, vulnerable & interminate species).
- 1.3 Plants as a natural resource: a general account with reference to timber, food & medicines.
- 1.4 Degradation of plant resources: Causes & Consequences.
- 1.5 Priorities for Conservation of plant resources: wild relatives of crop plants, land races, advanced cultivars, medicinal plants & wild plants of potential utility.

#### **UNIT -II : NATURAL RESOURCES - WATER & ANIMALS**

- 2.1 Water as a natural resource: as a medium for live and as a life support system .
- 2.2 Water forms, their distribution and water resources of India .
- 2.3 Animals as a natural resources : a general account with reference to game, wildlife & food.
- 2.4 Depletion of Animal resources : Causes & consequences
- 2.5 Alternate sources of proteins.

#### **UNIT -III : NATURAL RESOURCES - SOIL & MINERALS**

- 3.1 Soil as a natural resource: a general account with reference to nutrients & soil biota
- 3.2 Role of agricultural practices in soil degradation.
- 3.3 Role of wind & water erosion in soil degradation.
- 3.4.1 Origin, distribution & uses of economic minerals.
- 3.4.2 Exploitation of mineral resources from oceans with special reference to India.
- 3.5.1 Impact of exploitation of economic minerals on environment.
- 3.5.2 Methods of conserving the economic mineral resources.

#### **UNIT -IV : NATURAL RESOURCES - ENERGY**

- 4.1 Energy : scenario in India , conservation measures used .
- 4.2 Coal, oil & natural gas
- 4.3 Hydro energy, wind energy , tidal energy.
- 4.4 Solar energy , Nuclear energy
- 4.5 Biogas, fire wood ,Petroplants, Dendro thermal energy

#### **UNIT -V : NATURAL RESOURCES-CONSERVATION STRATEGIES & MANAGEMENT**

- 5.1 Insitu conservation of plants & animal species: Natural Parks, Biosphere reserves & sanctuaries.
- 5.2 Exsitu conservation: Botanical gardens, Zoological parks, tissue culture techniques, cryo - preservation of pollen, seeds & sperms
- 5.3 Conservation of soil.
- 5.4 Management of Grasslands.
- 5.5 Conservation of Forest, social forestry & agro forestry.

#### **NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total Ten Questions) & the candidates shall be required to answer ONE QUESTION from each unit (Total questions to be attempted will be Five) i.e. There will be internal choice within each unit.

#### **LITERATURE RECOMMENDED :**

- 1.Bandhu,Desh (1987).Env. Education for conservation & Development. Indian Environment Society New Delhi.
2. Brady, N.C. (1974).The nature & properties of soil McMillan & Co.
- 3.Chaturvedi,A.N.(1994).Management of India's forest resources.Khanna Bandhu, Dehradun.
- 4.Dar,G.H.; Bhagat,R.C.;Khan,M.A.(2002). Biodiversity of the Kashmir Himalaya. Anmol Publication, Pvt. Ltd. New Delhi.
- 5.Dasman,R.F.(1981). Wildlife Biology.2nd edition. John Wiley & Sons.New York
- 6.Frankle, O.H. & Hawkel,J.G. (1975) .Plant genetic resources. International Biological Programme-2, Cambridge Univ. Press London.
- 7.Gautam,A.& Rastogi,S.(2003).Resource Geography.International Publishing House,Meerut
- 8.Gupta,K.C.(2002). Energy & Environment in India - A study of Energy Management. Gyan Publishing House, New Delhi.
- 9.Heywood, V.H.(1995). Global Biodiversity Assessment. Cambridge University Press, UK
- 10.Jadhav,H.V. (1997) Energy & Environment. Himalaya Publishing House. Delhi.
- 11.Jairajpuri, M.S. (1991). Animal Resources of India - Protozoa to mammalia - State of the Art. Zoological survey of India. XI-XXVII.
- 12.Kathiresan, S.B. (1986). Essentials of forest management.Natraj Publishers Dehradun.
- 13.Kumar, H.D. (1995). Modern concepts of Ecology.Vikas Pub. House, Pvt. Ltd. New Delhi.
- 14.MaDicken, K.G. & Vergora, N.T. (1990). Agroforestry : classification & Management, John Wiley & sons, New York.
- 15.Nautiyal,S. & Kaul,A.K.(1999). Forest Biodiversity & its Conservation Practices in India. Oriental Enterprises,Dehradun,India.
- 16.Negi,S.S.(1992). Himalayan Wildlife, Habitat & Conservation. Indus Publishing Company, New Delhi.
- 17.Owen,O.S. & Chiras, D.D. (1995). Natural Resources Conservation. Prentice Hall India
- 18.Rana,S.V.S.(2003). Essentials of ecology & Environmental sciences. Prentice Hall Of India.
- 19.Singh,M.P.(2004). Natural Resources & renewable Energy. Daya Publishing House,Delhi.
- 20.Tiwari, P.C. (1995) .Natural Resources & sustainable development in Himalaya. Shree Almora Book Depot., India.

**Detailed Syllabus**  
**Semester - III**

Course No. 500  
Credit : 4

Title : Wildlife Ecology  
Max. Marks: 100  
a) Semester Exam. : 80  
b) Sessional Assessment : 20

Duration of Exam.: 3 hours

**Syllabus for the examinations to be held in**  
**Dec. 2010 ;Dec. 2011 & Dec. 2012**

**OBJECTIVES :**

There is a growing need for knowing what wildlife means and its importance in the balance of nature. The designed Course is intended to convey the desirous students information regarding status of wildlife in India, its management along biological lines and the techniques associated with it. The course highlights major approaches for problem solutions & the way of implementing these solutions, with the over-riding goal of giving students a scientific point of view in understanding management of wildlife resources & its importance in India.

**UNIT - I : WILDLIFE AND WILDLIFE HABITAT**

- 1.1 Wildlife : Definition, concepts & importance of wildlife in biological studies.
- 1.2 Methods of studying wildlife (Birds & Mammals) in their natural habitat
- 1.3 Wildlife as a Natural Resource.
- 1.4 Wildlife Habitat : Forest, Desert & Grassland with their characteristics wildlife.
- 1.5 Forest:Types,ecological characteristics&distribution pattern in India

**UNIT - II : WILDLIFE HABITAT ANALYSIS AND EVALUATION**

- 2.1 Forest range evaluation methods.
- 2.2 Habitat management with respect to cover & water
- 2.3 Food habit analysis of wildlife species
- 2.4 Wildlife damages : Assessment & Control.
- 2.5 Wildlife Census methods.

**UNIT - III : ENVIRONMENT DEGRADATION & WILDLIFE**

- 3.1 Impact of Environment pollutants on wildlife.
- 3.2 Changed landuse pattern and its effect on wildlife.
- 3.3 Wildlife diseases(Viral, Bacterial, Protozoan, Helminthis and Ticks).
- 3.4 Man & Wildlife conflict.
- 3.5 Wildlife management principle.

**UNIT - IV : SOCIOBIOLOGY OF WILD ANIMALS**

- 4.1 Social organization in wild animals.
- 4.2 Evolution of Societies : Cost and benefit of social living.
- 4.3 Role of social behaviour in population regulation.
- 4.4 Sexual selection : Intrasexual selection (Male-male competition), Inter sexual selection (Female choice).
- 4.5 Social life in Primates.

**UNIT - V : STATUS & DISTRIBUTION OF WILDLIFE IN INDIA**

- 5.1 Zoo-geographic subdivisions of India based on important mammalian fauna.
- 5.2 Endangered Wildlife species (Birds & Mammals) of India.
- 5.3 Important Wildlife species of J&K State.
- 5.4 Conservation sites of J&K with characteristic Wildlife.
- 5.5 Important National Parks, Wildlife Sanctuaries & Biosphere Reseriies in India with characteristic Wildlife.

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total Ten Questions) & the candidates shall be required to answer ONE QUESTION from each unit (Total questions to be attempted will be Five) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Berwick, S.H. & Sharma, V.B. (1995). Wildlife Research & Management, Oxford Univ. Press, Delhi.
2. Champion, H. C. & Sheth, S.K. (1968). A revised Survey of the Forest Types of India Pub. Manager, Col. Press- Nasik/Manager of Publication Delhi-6.
3. Dassman, R.F. (1982). Wildlife Biology (II Ed.). Wiley Eastern Ltd., New Delhi.
4. Giles, R.H. (1984). Wildlife Management Techniques. The Wildlife Society, Washington, D.C.
5. Leopold, A. (1933). Game Management. Charles Scribner's Sons, New York, London.
6. Odum, E.P. (1971). Fundamentals of Ecology. W.B. Saunders Co./ Toppan Co. Ltd.
7. Prater, S.H. (1980). The Book on Indian Animals. BNHS, Bombay.
8. Schaller, G. B. (1987). The Deer & the Tiger. ZSI, Calcutta.
9. Sparke, J. (1970). Bird Behaviour. Govosset & Dulop, Inc. New York .
10. Stoddart, A.I. (1975). Range Management: Pub. McGraw Hill, Col. Inc. New York
11. Teague, R.D. (1971). A manual of Wildlife Conservation Pub. The Wildlife Society, Washington, D.C.
12. Tikader, B.K. (1983). Threatened Animals of India. ZSI, Calcutta.

**Detailed Syllabus**  
**Semester - III**

Course No. 505

Credit : 4

Duration of Exam.: 3 hours

Title : Environmental Impact  
Assessment & Management

Max. Marks: 100

a) Semester Exam. : 80

b) Sessional Assessment : 20

**Syllabus for examination to be held in**  
**Dec. 2010 ;Dec. 2011 & Dec. 2012**

**OBJECTIVES :**

The environment Impact Assessment is among the tools which in recent years have been employed widely to determine the impacts of various activities on the environment with a view to avoid or mitigate such impacts. Deterioration in environmental quality increased with the increase in human activities. The objective of environmental impact assessment is to make available, information on the environmental repercussions of impacts of a project or other developmental activities. The main purpose of this course is to apprise the students of various principles & methodologies of Env. Impact Assessment, consequences of developmental projects & other activities of man which in turn will enhance their decision making ability.

- UNIT - I :**
- 1.1 Environmental Impact Assessment (EIA) : Concepts, objectives, origin & generalised approach to EIA.
  - 1.2 Methodologies of EIA and EIA guidelines (GOI Notification of 1994, 2006).
  - 1.3 Environmental Impacts, their types & important impacts to be considered in EIA .
  - 1.4. Environmental Impact Statement & Environmental Management Plan.
  - 1.5 Environmental Auditing : Concept & guidelines.

**UNIT - II : EIA OF :**

- 2.1 River valley Projects.
- 2.2 Mining Projects.
- 2.3. Oil refinery
- 2.4. Thermal Power Project
- 2.5 Cement Industries

**UNIT - III : PREDICTION & ASSESSMENT OF IMPACTS ON :**

- 3.1 Water Environment
- 3.2 Air Environment
- 3.3 Noise Environment
- 3.4 Socio-Economic & Cultural Environment
- 3.5 Biological Environment

**UNIT - IV :**

- 4.1. Impact of tourism on Environment
- 4.2 Biotic impact on flora & fauna in Himalaya
- 4.3. An Introduction to Watershed & its management
- 4.4 Wastelands & their reclamation.
- 4.5 Environmental Education , formal & informal education & their role in environmental Awareness.

**UNIT - V :**

- 5.1 Environmental priorities in India & sustainable development
- 5.2 Land use & Land capability classification for sustainable Env.
- 5.3 Ecotourism & environment : concept, objectives and its role in sustainable environment management .
- 5.4 United Nations Environment Programme (UNEP) .
- 5.5 An outline of National Land use policy and its critical appraisal .

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total Ten Questions) & the candidates shall be required to answer ONE QUESTION from each unit (Total questions to be attempted will be Five) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Baldwin, J.H. 1985. Environmental Planning & Management. International Book Distributors. Dehradun, India.
2. Bandhu, D., Bongartz, H., Ghazawal, A.C. & Gopal B. 1994. Environmental Education for sustainable development. Indian Environmental Society, New Delhi.
3. Cantar, L.W. (1977). Environmental Impact Assessment. Mc.Graw Hill, Pub., New York.
4. Rajora, R. (2002). Integrated Watershed Management. Rawat Publications, Jaipur & New Delhi.
5. Sapru, R.K. 1987. Env. Management in India, Ashish Publishing House, New Delhi.
6. Singh, S.S., 1989. Impact of tourism on mountain env.. Research India Publication, Meerut
7. Trivedi, P.R. & Raj, C., 1992. Env. Problems Impact Assessment. Akashdeep Pub. House, New Delhi
8. Trivedi, P.R. & Raj, C., 1992. Env. Biology, Akashdeep Pub. House, New Delhi
9. UNEP (United Nations: Env. Programme) 1980. Industry & Env. Series, Vol. 1.
10. United Nations 1994. Trends in Environmental Impact Assessment of Energy Projects.

**Detailed Syllabus**  
**Semester - III**

Course No. : 506

Credits : 4

Duration of Examination : 3 Hrs.

Title : Environmental Pollution :  
Hazards and Control

Max. Marks: 100

(a) Semester Examination :80

(b) Sessional Assessment : 20

**Syllabus for the examinations to be held in**  
**Dec. 2010 ;Dec. 2011 & Dec. 2012**

**OBJECTIVES :**

This course has been designed to introduce the students with various causes, problems and control of pollution. Pollution of this earth started with the development of intelligence in mankind. But in the modern times, due to population explosion and simultaneous urbanization and industrialization, new problems have plagued the humanity. Consequently, soil pollution, air pollution, noise pollution, radiation pollution, water pollution etc. have become very important.

**UNIT- I : AIR POLLUTION**

- 1.1. Sources and kinds of air pollution.
- 1.2. Air quality standards
- 1.3. Odour pollution
- 1.4. Indoor air pollution
- 1.5. Vehicular pollution & its control

**UNIT- II : AIR AND NOISE POLLUTION**

- 2.1. Common effects of air pollution on materials , human beings, animals & vegetation
- 2.2. Gaseous pollutants and their control
- 2.3. Particulate pollutants and their control
- 2.4. Air pollution & climate change : Acid rain,Ozone depletion & Global warming
- 2.5. Noise pollution : sources , effects and control

**UNIT -III : LAND POLLUTION**

- 3.1. Sources and control of Soil pollution
- 3.2. Sources and management of municipal solid waste
- 3.3. Sources and management of Biomedical waste
- 3.4. Sources and management of Hazardous waste
- 3.5. Sources and management of Industrial waste.

**UNIT -IV : WATER POLLUTION I**

- 4.1. Sources and kinds of water pollution.
- 4.2. Water quality standards
- 4.3. Effects of water pollutants on physico-chemical characteristics of water
- 4.4. Effects of water pollutants on plants : phytoplankton and macrophytes
- 4.5. Effects of water pollutants animals : zooplankton, macrobenthic invertebrates & fish

**UNIT -V : WATER POLLUTION II**

- 5.1. Sources and kinds of marine pollution
- 5.2. Effects and control of marine pollution
- 5.3. Sources, effects and control of thermal pollution
- 5.4. Eutrophication and restoration of lakes
- 5.5. Groundwater contamination and control

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (total TEN questions) and the candidate will be required to answer ONE QUESTION from each unit (total questions to be attempted will be FIVE) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Bretsehnedder, B. & Kurfurst, J.(1987). Air Pollution. Elsevier Scientific Pub. Co. Amsterdam, Oxford, New York.
2. Bridgman, H. (1992). Global Air Pollution. CBS Pub. New Delhi.
3. Bush, M.B. (1997). Ecology of a changing planet. Prentice Hall, USA.
4. Dassber, H.S. & Bortitz, S. (1988). Air pollution & its influence on vegetation. Dr.W.Junk Pub. Dor drencht-Bostan Lancaster.
5. Davis, M.L. & Cornwell,D.A. (1991). Intro. Oto Environmental Engg. McGraw Hill International Edition.
6. Dhaliwal,G.S.; Sawgha,G.S.& Ralhan, P.K. (1996). Fundamentals of Environmental Science. Kalyani Pub., Ludhiana.
- 7.Edward, C.A. (1976). Environmental Polution by Pestacades. Plenum Press, London & New York.
8. Kamboj, N.S. (1999). Control of Noise Pollution. Deep & Deep Pub. Pvt. Ltd., New Delhi.
- 9.Kudesia, V.P. (1990). Air pollution.Pragati Prakashan, Meerut - 250001.
10. Misra, S.C. And Mani, D. (1994). Agricultural Pollution.(Vol. I). Ashish Publishing House 8/81, Punjabi Bagh, N. Delhi - 110026.
11. Naji,G.K.;Dhillon, M.K.; Dhaliwal, G.S.(1999). Noise Pollution. Commonwealth Pub., New Delhi.
12. Odum,E.P. (1996). Fundamentals of Ecology. Natraj Pub. Dehradun.
13. Patrick, R. Dugan (1972). The Water pollution problems (Part-I). Plenium Publishing corporation 227, West. 17th Street, New York - 110011.
14. Prasad, O & Choudhary, M.C. (1992). Environmental Pollution Radiation, Venus Publishing House 11/298 press Colony, Maya Puri, N. Delhi.
15. Rana, S.V.S. (2003). Essentials of Ecology & Environmental Sciences.Prentice Hall of India, New Delhi.
16. Rao, M.N. & Rao, H.U. (1998). Air Pollution. Tata McGraw Hill Pub. Company, New Delhi.
17. Tripathi, A.K. (1992). Air pollution. Vol.I. Ashish Publishing House 8/81, Punjabi Bagh, N. Delhi - 110026.

**Detailed Syllabus**  
**Semester - III**

Course No. : 507

Credits: 2

Duration of Examination : 2 hours.

Title : Environmental Analysis &  
Instrumentation

Max. Marks : 50

a) Semester Exam. : 40

b) Sessional Assessment : 10

**Syllabus for examination to be held in**  
**Dec. 2010 ;Dec. 2011 & Dec. 2012**

**OBJECTIVES :**

The main object of this course is to acquaint student with number of instruments & related analytical methods that can be used for characterization of pollutants in the environment & quantification of observation.

**UNIT - I AIR AND WATER ANALYSIS :**

- 1.1. Sampling & Analysis of physico-chemical parameters of Air : SPM, NO<sub>2</sub>, SO<sub>2</sub> & Relative humidity
- 1.2. Biological Parameters of Air : Bacteria & fungi (Standard plate Count).
- 1.3. Sampling & Analysis of physical parameters of water : movement, colour, temperature, annual heat budget, transparency, turbidity
- 1.4. Analysis of Chemical Parameters of water : COD, BOD, Total dissolved solid, Total suspended solid
- 1.5. Analysis of Chemical Parameters of water : Na, K, P, NO<sub>3</sub>

**UNIT - II PHOTOMETRY :**

- 2.1. Principle, Operation & Application of Colorimetry.
- 2.2. Principle, Operation & Application of Spectrophotometer
- 2.3. Principle & instrumentation of Atomic Absorption Spectrophotometer.
- 2.4. Principle, instrumentation & application of Flame Photometer.
- 2.5. Principle & application of Infrared Spectrophotometer.

**UNIT -III CHROMATOGRAPHY :**

- 3.1. Paper Chromatography- Principle,types,experimental procedures & application.
- 3.2. Thin Layer Chromatography- Principle,experimental procedures & application
- 3.3. Gas Liquid Chromatography - Principle & experimental procedures
- 3.4. Gas Chromatography - Components of Gas Chromatography & their description.
- 3.5. High Pressure liquid Chromatography - Principle, instrumentation & Application.

**NOTE FOR PAPER SETTER :**

The examiner will set 6 (Six) questions ( two from each unit). The student shall attempt 3 (three) questions atleast one from each unit. The choice being cent percent.

**BOOKS RECOMMENDED :-**

- Rajvaidya, N. & Markenday, D.K. : Environmental Analysis & Instrumentation (Vol.2)  
A.P.H. Pub.Co.5, Ansari Road,DaryaGanj,N. Delhi.
- A.P.H.A. : Standard Methods for the examination of water  
& wastewater, 20th edition. Am. Pub. Hlth. Asso. ,  
Washington.

## Detailed Syllabus Semester - III

Course No. : 508  
Credits : 2

Title : Eco-toxicology  
Max. Marks: 50  
(a) Semester Examination :40  
(b) Sessional Assessment : 10

Duration of Examination : 2Hrs.

### Syllabus for examination to be held in Dec. 2010 ;Dec. 2011 & Dec. 2012

#### **OBJECTIVES :**

The aim of the present course is to acquaint the students with various aspects of environmental toxicology from molecular to ecosystem level so as to equip students to evolve best ways of dealing chemical pollution.

#### **UNIT -I : CONCEPT, HISTORICAL BACKGROUND AND DEFINITIONS**

- 1.1 Basic Concepts of Toxicology
- 1.2 Development of environmental toxicology - Historical and evolutionary perspective.
- 1.3 Toxicants and Toxicity - factors that effect toxicity.
- 1.4 Toxicity of chemical mixtures
- 1.5 Dose effect and response ; Dose-response relationships.

#### **UNIT -II : ROUTES AND KINETICS OF TOXICANT UPTAKE**

- 2.1 Toxicity testing - Testing for acute toxicity and chronic toxicity.
- 2.2 Toxicokinetics - Absorption, Distribution and elimination of toxicants.
- 2.3 Route of toxicant uptake - skin, lungs, GIT, gills, toxicant uptake in plants.
- 2.4 Biochemical effects of Mercury, Lead, Chromium, Cadmium, Arsenic and their relation to toxicity.
- 2.5. Biotransformation and bioaccumulation

#### **UNIT -III :COMPLEX ISSUES**

- 3.1. Antidotal procedure in toxicology.
- 3.2. Bioassays & its application
- 3.3. Biological indicator of toxicants.
- 3.4. Methodology of ecological reassessment and risk management.
- 3.5. Environmental toxicology of fertilizers.

#### **NOTE FOR PAPER SETTER :**

The question paper will contain THREE UNITS each unit with two questions (total SIX QUESTIONS) and the candidate will be required to answer ONE QUESTIONS from each unit (total questions to be attempted will be THREE) i.e. There will be internal choice within each unit.

#### **LITERATURE RECOMMENDED :**

1. Wright, D.A. & P.Welbown (2002)-Environmental Toxicology, Cambridge Univ. Press, U.K.
- 2.Banerjee, S.K. (2010). Environmental Chemistry 2001. Prentice Hall of India Pvt. Ltd., New Delhi.
- 3.Satake, M.Y. Mldo ; H. Ysuhisa, S.; Taguchi, M.S.; Sethi, S.A., Iqbal (1997). Environmental Toxicology, Discovery Pub. House, New Delhi.
- 4.De,A.K. (2003) Environmental Chemistry, New Age Int. Lts. N. Delhi.
- 5.Sood, A.(1999). Toxicology, Sampand Songs, N. Delhi.

**Detailed Syllabus**  
**Semester - IV**

Course No. 552

Credit : 4

Duration of Exam.: 3 hours

Title : Environment & Law  
(New Course)

Max. Marks: 100

a) Semester Exam. : 80

b) Sessional Assessment : 20

**Syllabus for the examinations to be held in**  
**May,2011 ; May2012, and May 2013**

**OBJECTIVES :**

The main objective of this course is to acquaint the students with elementary principles of environmental Laws to enable them to make proper & effective use of their professional abilities. Because the scientific gains can be put into use within the parameters of a legal system & the science & Law must be subservient to the needs of the society.

**UNIT - I: INTRODUCTION TO ENVIRONMENTAL LAWS**

- 1.1 Environmental Protection : Issues & Problems
- 1.2 Key International Efforts for Environmental protection
- 1.3 Sustainable Development : Essential features and Legal Implications
- 1.4 UN Framework Convention on Climate Change, 1992
- 1.5 Kyoto Protocol, 1997

**UNIT - II : ENVIRONMENTAL PROTECTION AND THE LAW**

- 2.1 Environment (Protection) Act, 1986 : Salient Features.
- 2.2 Powers of Central Government under EPA
- 2.3 Prevention , Control & abatement of environmental pollution under EPA
- 2.4 Hazardous wastes (Management, Handling and Transportation) Rules, 2008
- 2.5 Public Liability Insurance Act, 1991.

(Note : Only relevant provision of the above Acts)

**UNIT - III : POLLUTION ABATEMENT AND THE LAW**

- 3.1 Water ((Prevention & Control of Pollution) Act, 1974 : Salient Features
- 3.2 Powers and Functions of CPCB & SPCB under Water Act
- 3.3 Air (Prevention & Control of Pollution) Act, 1981.
- 3.4 Powers and Functions of CPCB & SPCB under Air Act
- 3.5 Noise pollution (Regulation and Control) Rules, 2000

(Note : Only relevant provisions of the above Acts)

**UNIT - IV: NATURAL RESOURCE CONSERVATION AND THE LAW**

- 4.1 Wildlife (Protection) Act , 1972 : Salient Features
- 4.2 Protected Areas and Trade & Commerce under WPA
- 4.3 National Forest Policy
- 4.4 Forest Conservation Act, 1986
- 4.4 Biological Diversity Act, 2002

(Note : Only relevant provisions of the above Acts)

## **UNIT - V : JUDICIAL ACTIVISM AND ENVIRONMENTAL PROTECTION**

- 5.1 Indian Constitution and Environmental Protection
- 5.2 Judicial Response towards Environmental Protection
- 5.3 Public Nuisance under IPC ( Sections 268,277,278,284, 290,291)
- 5.4 Sections 133-143 of Criminal Procedure Code, 1973.
- 5.5 Role of NGO's for the promotion and protection of Environment.

### **NOTE FOR PAPER SETTER :**

- I) Students being from science stream have no legal background, hence only elementary knowledge of the environmental laws is expected from them.
- II) The question paper will contain TWO QUESTIONS from each unit (Total Ten Questions) & the candidates shall be required to answer ONE QUESTION from each unit (Total questions to be attempted will be Five) i.e. There will be internal choice within each unit).

### **LITERATURE RECOMMENDED :**

1. Diwan,P. (1997). Environmental Administration - Law & Judicial Attitude, Vol. I, II. Deep & Deep Pub. New Delhi.
2. Divan, S.and Roscencranj, A. (2001). Environmental Law & Policy in India. Oxford Pub. New Delhi.
3. Lal, S. (1990). Commentaries on Water, Air pollution & Environment (protection) Law. Law Pub. Pvt. Ltd. India.
4. Leelakrishnan, P. (1999) . Environmental Law in India. Butterworths Publications, New Delhi.
5. Singh, G. (1995). Environmental Law : International & National Perspectives.

### **ARTICLES :**

1. Jariwala, C.M. (2000). Complex Enviro-Technoscience Issues. 42 (1), Jr. Of Indian Law Institute. 29.
2. Jasrotia, A. (2002). Environmental Odyssey in India : People's response & judicial vigilance - An estimate. Punjab Univ. Law Review. 132-137.
3. Jasrotia, A. (2003). Global Environmental Law : Emerging concepts & dimensions. Kashmir Univ. Law Review. Vol. X. 171-190.
4. Jasrotia, A. (2003). Survival of the Earth : Vedic Profundity In S.C. Raina et.al. (Ed.) Law & Development : An anthology of topical legal studies. Regency Pub. New Delhi. 102-109.
5. Tiwari, G.S.(2001). Conservation of Biodiversity & Techniques of people's activism. 43(2). Jr. Of Indian Law Institute. 191.

**Detailed Syllabus**  
**Semester - IV**

Course No. 558

Credit : 2

Duration of Exam.: 2 hours

Title : Basic course in  
Environmental Economics

Max. Marks: 50

(a) Semester Exam. : 40

(b) Sessional Assessment : 10

**Syllabus for the examinations to be held in**  
**May,2011 ; May2012, and May 2013**

**OBJECTIVES:**

The relationship between economic development and the environment requires many choices. Some basis for making rational choices is absolutely necessary for making any decision. The economic approach views the environment as a composite asset, supplying a variety of services to society . The intensity & composition of these services depend on the actions of humans as constrained by the physical laws. Economics has different means of enhancing the understanding of environmental & natural resource economics. These approaches are useful in describing the actions of the people and the impact of those actions on the environmental asset and provide guidance on how optimal service flows can be defined and achieved. This course has been designed with an objective to make the students with Environmental Sciences background aware about the causes and consequences of economic growth, role of natural resources and environmental control , in the growth process and better understanding about how choices are made in economic & political systems and how these choices affect, and are affected by the natural environment.

**UNIT -1 : ENVIRONMENTAL ECONOMICS AND ENVIRONMENTAL VALUATION**

- 1.1 Environmental economics : concept and scope, Environment & development .
- 1.2 Market failure and Externalities : concept, types and solutions.
- 1.3 Environmental valuation : concept, relationships and general principles
- 1.4 An introduction to Valuation methods : Hedonic property values and household production models.
- 1.5 Cost- Benefit Analysis for Environmental Assessment : An overview.

**UNIT - 2 : ECONOMICS OF NATURAL RESOURCES MANAGEMENT AND SUSTAINABLE DEVELOPMENT**

- 2.1 Optimal use of non renewable and renewable natural resources.
- 2.2 Concept and indicators of sustainable development.
- 2.3 Integrated Environmental accounting for sustainable development .
- 2.4 Environmentally corrected GDP- An introduction.
- 2.5 ISO - 14001 an outline.

**UNIT - 3 : DEVELOPMENT AND THE ENVIRONMENT**

- 3.1 Population, poverty and Environment : Relationships.
- 3.2 Common property resources & people's participation in their management.
- 3.3 Economic measures to create incentives for Environmental management
- 3.4 Overview of National Environmental policy , 2006
- 3.5 Clean development mechanism and carbon trading to combat Global Climate Change

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (total SIX QUESTIONS) and the candidate will be required to answer ONE QUESTIONS from each unit (total questions to be attempted will be THREE) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Alan Gilpin (1999). Environmental Economics : A Critical Overview, John Wiley & Sons Ltd., New York.
2. Bromely, D.W. (Ed) (1995). Handbook of Environmental Economics. Blackwell, london.
3. Crones,R. And T. Sandler (1989). The Theory of Externalities and Public Goods. Cambridge Univ. Press, Cambridge.
4. ESCAP (1997). Accounting and Valuation of Environment - A Primer for Developing Countries, Vol.1. U. Nations, New York.
5. Fisher, A.C. (1981). Resource & Environmental Economics , Cambridge.
6. Hanley, Nick & Colin J.Roberts (2002). Issues in Environmental Economics. Blackwell Pub. Ltd.
7. Hussen, A.N.(1999). Principles of Environmental Economics , Rutledge, London.
8. Jeroen, C.J.M. (1999). Handbook of Environmental and Resource Economics, Edward, Elgar Pub. Ltd. , U.K.
9. Joshi,M.V. (2001). Theories & Approach of Environmental Economics. Atlantic Pub. & Distributors , New Delhi.
10. Kerr, J.M. (1997). Natural Resource Economics: Theory & Applications in India. Oxford and IBH Publications.
11. Kolstad, C.D. (1999). Environmental Economics, Oxford University Press, New Delhi.
12. Mitchell, R.C. & R.T. Carson (1993) . Using Surveys to Value Public Goods : Resource for the Future, Washington, D.C.
13. Sankar, U. (Ed) (2001). Environmental Economics, Oxford University Press, New Delhi.
14. Sengupta, R.P. (2001). Ecology & Economics- An Approach to Sustainable Development Oxford University Press, New Delhi.
15. Smith, V. Kerry (1996). Estimating Economic Values for Nature : Methods for Non-market Valuation. Edward Elgar, U.K.

**Detailed Syllabus**  
**Semester - IV**

Course No. 559

Title : Environmental Biotechnology

Credit : 2

Max. Marks: 50

(a) Semester Exam. : 40

(b) Sessional Assessment : 10

Duration of Exam.: 2 hours

**Syllabus for the examinations to be held in**  
**May,2011 ; May2012, and May 2013**

**OBJECTIVES:**

The study of this course will help the students to protect the environment from pollution & to conserve natural resources because the rapid industrialisation, urbanisation & other developments are constant threat to the clean environment & to the depleting natural resources. Moreover, the threats to the environment are also from release of genetically engineered organisms in the atmosphere & due to release of effluents from biotechnological companies. Thus, the study of course will help to develop cleaner & sustainable environment in future.

**UNIT -I : INTRODUCTION & POLLUTION CONTROL**

- 1.1 Definition, Historical background, scope & importance of biotechnology.
- 1.2 Biosorption - use of bacteria, fungi and algae in biosorption.
- 1.3 Biodegradation of polychlorinated hydrocarbons
- 1.4 Biodegradation of Pesticides
- 1.5 Microbial treatment of oil pollution.

**UNIT -II : RECYCLING AND RECLAMATION**

- 2.1 Conventional waste water treatment strategies using biosystem. Activated sludge process, Trickling filter, Rotating Biological contactor (RBC) and Fluidized Beds.
- 2.2 Role of Biotechnology in :
  - 2.2.1. Energy production from Biomass
  - 2.2.2. Fuel Alcohol production.
  - 2.2.3. Hydrogen production.
- 2.3 Biotechnology for restoration of degraded land
  - 2.3.1. Reforestation through micropropagation.
  - 2.3.2. Use of mycorrhizae in reforestation.
  - 2.3.3. Use of microbes in improving soil fertility.
- 2.4 Use of microbes as bioinsecticide
- 2.5 Use of microbes as biofungicide and bioherbicides.

**UNIT -III : NOVEL METHODS FOR POLLUTION CONTROL**

- 3.1 Biotechniques for Air pollution Abatement & odour control - Bioscrubbers, Biobeds, Biotrickling filters
- 3.2 Production of bio- fertilizers
- 3.3 Vermitechnology
- 3.4 Waste water treatment using aquatic plants
- 3.5 Biodegradable plastics - Bioplastics

**NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total SIX Questions) & the candidates shall be required to answer ONE QUESTION from each unit (Total questions to be attempted will be Three) i.e. There will be internal choice within each unit.

**LITERATURE RECOMMENDED :**

1. Abbasi, S.A. & Ramasami,E. (1999). Biotechnological Methods of Pollution Control. Universities Press (India) Ltd., Hyderabad.
2. Chaterjii,A.K. (2002). Introduction to Environmental Biotechnology. Prentice Hall of India. Pvt. Ltd. N. Delhi.
3. Gupta, P.K. (1994).Elements of Biotechnology.Rastogi & Co. Meerut
4. Higgins et.al.(1984). Biotechnology - Fundamentals & Principles. Blackwell Publishers, London.
5. Jogdand, S.N. (1995). Environmental Biotechnology. Himalayan Publishing House, New Delhi.
6. Mukherjee, R.N. (1992). Down stream processing in Biotechnology. Tata McGraw Hill Publishers Co.New Delhi.
7. Purohit, S.S. &Mathur, S.K. (1996).Biotechnology Fundamentals & Applications .Agro botanical Publication, New Delhi.
8. Sohal, H.S. & Srviastava,A.K. (1994).Environment & Biotechnology.Ashish Pub. House, New Delhi.

**Detailed Syllabus**  
**Semester - IV**

Course No. 560

Credit : 4

Duration of Exam.: 3 hours

Title : Environmental Health  
Hazards & Sanitation

Max. Marks: 100

(a) Semester Exam. : 80

(b) Sessional Assessment : 20

**Syllabus for examination to be held in**  
**May 2011; May, 2012 & May, 2013**

**OBJECTIVES :**

The purpose of this course is to familiarize the students with various forms of life substances, forces & conditions in the surroundings of man that may exert an influence on man's health & well being. This would help the students in assessing the peculiar needs of modern man & the current environmental hazards to man which are result of man's activities or his modification of environment. The main aim of this course is to make students fit for planning & administration of environmental control programmes.

**UNIT - I : ENVIRONMENT & HEALTH**

- 1.1 Concept , indicators and determinants of health
- 1.2 Environmental hazards : physical, chemical, biological , sociological & psychological
- 1.3 Concept , causation and natural history of disease
- 1.4 Principles of environmental control
- 1.5 National health policy and health situation in India

**UNIT - II : OCCUPATIONAL HAZARDS**

- 2.1 Environmental Surveys : recognition of hazards, preliminary survey & evaluation of Environmental exposure.
- 2.2 Dust diseases (Pneumoconiosis) with particular reference to Silicosis. Asbestosis, Anthracosis, Bagaossis & Byssinosis
- 2.3 Occupational cancers
- 2.4 Occupational Dermatitis : frequency, causes & prevention.
- 2.5 Prevention of occupational diseases

**UNIT -III : DISEASE VECTORS**

- 3.1 Introduction :
  - 3.1.1 Mosquitoes vector of diseases: Malaria, Dengue & Encephalitis.
  - 3.1.2 Mosquito surveillance.
  - 3.1.3 Control of mosquitoes: Biological, chemical & environmental
- 3.2 Flies vectors of diseases: Viral, bacterial, Protozoan & Helminth
  - 3.2.1 Fly population measurements
  - 3.2.2 Community control programme
- 3.3 Cockroach & spiders as disease vectors
- 3.4 Ticks & bed-bugs as disease vectors
- 3.5 Rodents as disease vector :
  - 3.5.1 Plague, Murine typhus, Rickettsialpox, Leptospirosis, Rat Bite.
  - 3.5.2 Rodents surveillance
  - 3.5.3 Control of Rodents

#### **UNIT - IV : COMMUNICABLE DISEASES**

- 4.1 Communicable diseases - Dynamics of disease transmission
- 4.2 Water borne infections :Etiology, Pathogenesis & remedial measures of the following :-
  - 4.2.1 Diarrhoea and dysentery .
  - 4.2.2 Cholera
  - 4.2.3 Typhoid
- 4.3 Air borne infections :Etiology, Pathogenesis & remedial measures of the following :-
  - 4.3.1 Tuberculosis
  - 4.3.2 Influenza
  - 4.3.3 Diphtheria
- 4.4 Nosocomial infections and their control
- 4.5 General account, classification and control of zoonoses

#### **UNIT - V : SANITATION & HEALTH**

- 5.1 Urban community & sanitation problem
- 5.2 Health Engineering & city planning
- 5.3 Health communication and health education
- 5.4 Health systems in India
- 5.5 Health programmes in India with emphasis on AIDS, Iodine deficiency disorders, Leprosy, Malaria, Tuberculosis

#### **NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total Ten Questions) & the candidates shall be required to answer ONE QUESTION from each unit (Total questions to be attempted will be Five) i.e. there will be internal choice within each unit.

#### **LITERATURE RECOMMENDED :**

1. Alcamo, I.E. (1994). Fundamentals of Microbiology. The Benjamin/Cummings Pub. Co., USA.
2. Kumar, R. (1987). Environmental Pollution & Health Hazards in India. Ashish Pub. House, New Delhi.
3. Park, K. & Park, S. (2002). Textbook of preventive & social medicine. M/s Banarsi Das Hanot, Jabalpur.
4. Prescott, L.M.; Harley, J.P. & Klein, D.A. (1993). Microbiology. WCB Pub., USA.
5. Shukla, S.K. & Srivastava, P.R. (1992). Characterization of Health hazards in man & Environment. Commonwealth Pub. New Delhi.
6. Shukla, S.K. & Srivastava, P.R. (1992). Environmental Pollution & chronic diseases. Commonwealth Pub. New Delhi.
7. Tortora, G.J.; Funke, B.R. & Case, C.L. (1995). Microbiology - An Introduction. The Benjamin / Cummings Pub. Co., USA.
8. Upton, A.C. & Graber, E. (1993). Staying Healthy in a risky Environment. Simon & Schuster Pub., USA.

**Detailed Syllabus**  
**Semester - IV**

Course No. 561  
Credit : 4

Title : Disaster Management  
Max. Marks: 100  
a) Semester Exam. : 80  
b) Sessional Assessment : 20

Duration of Exam.: 3 hours

**Syllabus for examination to be held in**  
**May 2011; May, 2012 & May, 2013**

**OBJECTIVES :**

Disasters are all pervading phenomena in human affairs. These disasters strike sudden, unexpected & are wide spread. Environmental degradation which is often a result of economic development & associated human settlement patterns that ignore appropriate resource management can increase a country's vulnerability to natural hazards & aggravate the impacts. This course is designed to familiarise the students with various concepts of disasters & their management which include causes & effects of disaster, types, predictability, preparedness, nature of damage caused & also disaster mitigation, pre & post disaster management. The course will upgrade the information, knowledge & skill of the students which in turn will enable them to act with confidence in pre & post disaster situations.

**UNIT -I      DISASTER INTRODUCTION AND MAN-MADE DISASTERS - I**

- 1.1 Disasters: Meaning, difference between disaster and hazard, causal factors.
- 1.2. Disaster management cycle.
- 1.3 Man- Made Disasters, types, nature of man-made disasters, general effects, concerns for manmade disasters.
- 1.4 Biological disasters: meaning, types, vulnerability, effects, preparedness and mitigation.
- 1.5 Chemical Disasters: Causes and impacts, chemical disaster management, mitigation, preparedness and response

**UNIT-II      MAN-MADE DISASTERS - II**

- 2.1 Nuclear disaster: causes, effects, management.
- 2.2 Fires-I: Characteristics of fires; Building, coal, and chemical fires; causes; safety and prevention, safety norms and disaster management..
- 2.3 Fires II: Forest fires, their types, causes, impacts, mitigation and control.
- 2.4 Desertification: Causes, general characteristics and effects & mitigation measures.
- 2.5 Transportation Accidents: types, causes , impacts and disaster management.

**UNIT -III      NATURAL DISASTERS- I**

- 3.1 Natural disasters: introduction, meaning and nature, types of natural disasters, general effects.
- 3.2 Earthquake: General characteristics, vulnerability, causes, impacts related to earthquakes, prediction, warning and mitigation measures.
- 3.3 Volcanic eruptions: Nature and causes, volcanic hazard monitoring, mitigation.
- 3.4 Landslides: General characteristics, Causes, vulnerability, effects, prediction & warning, risk reduction mitigation measures.
- 3.5 Snow Avalanches: Avalanches formation and classification, hazard mitigation and management.

#### **UNIT IV NATURAL DISASTERS- II**

- 4.1 Cyclone: Formation, General characteristics, vulnerability, effects, Forecasting & warning, mitigation measures.
- 4.2 Floods: General characteristics, vulnerability Causes and impacts, forecasts & warning, Flood Plain zonation, mitigation measures.
- 4.3 Drought: Meaning, types, General characteristics, Causes and impacts, vulnerability, prediction & warning and mitigation measures.
- 4.4 Heat and Cold Waves: introduction causes and impacts, prevention and preparedness, Response.
- 4.5 Tsunami: General characteristics, causes, impacts and mitigation.

#### **UNIT - V :**

- 5.1 Disaster Response: Disaster response plans, Search, Rescue and evacuation, Community Health and Casualty Management and damage assessment.
- 5.2 Risk and Vulnerability assessment: Risk, Vulnerability, their concepts, elements at risk, Risk analysis techniques, vulnerability identification and factors associated with vulnerability.
- 5.3 Disaster preparedness: Concept and nature, Disaster preparedness plans, Role of Information, education, communication, & awareness.
- 5.4 Disaster mitigation: Concept, principles, mitigation approaches and strategies.
- 5.5 Recovery: Rehabilitation, its social and economic aspects, Housing to resist disasters, relocation, retrofitting, repairing and strengthening of houses.

#### **NOTE FOR PAPER SETTER :**

The question paper will contain TWO QUESTIONS from each unit (Total ten Questions) & the candidates shall be required to answer ONE QUESTION from each unit (Total questions to be attempted will be five) i.e. There will be internal choice within each unit.

#### **LITERATURE RECOMMENDED :**

1. Bryant, E.A. (1991). Natural Hazards, Cambridge University Press, Cambridge, New York.
2. Carter, W. Nick (1992). Disaster Management : A Disaster manager's handbook. ADB Publication, Manila.
3. Cuny, F. (1983) Disasters and Development, Oxford University Press, England.
4. Cutter, Susan, L. (1999). Environmental Risks & Hazards. Prentice Hall of India Pvt. Ltd. N. Delhi
5. Green, S. (1980). International Disaster Relief towards a Responsive system : Mc.Graw Hill Book Co. New York.
6. Gupta, H. (2003). Disaster Management, University Press, Hyderabad.
7. Prakash, I. (1995). Disaster Management, Rashtra Ghaziabad.
8. Sahini, P. & Ariabandu, M. N. (2003). Disaster Risk Reduction in South Asia. Prentice Hall of India Pvt. Ltd. New Delhi.
9. Sahni, P and Malalgoda, M. (2003). Disaster Risk Reduction in South Asia. Prentice-Hall of India, New Delhi.
10. Sinha, P.C. (1998). Encyclopaedia of Disaster Management series. Anmol Pub., New Delhi.
11. Smith, K. (1996). Environmental Hazards, Assessing risk & Reducing disaster, Routledge, London.

