INDIRA GANDHI NATIONAL TRIBAL UNIVERSITY, AMARKANTAK (M.P.)

(A Central University established by an act of Parliament of India)

RECOMMENDED COURSE FOR
B.Sc. HONOURS ENVIRONMENTAL SCIENCE

Semester Pattern

COURSE NO.	PAPERS	Internal Assessment	Theory Marks	Total Marks
	SEMESTER I			
EVS T 101	BASIC PRINCIPLES OF ECOLOGY	10	40	50
EVS T 102	BASICS OF PHYSICAL SCIENCES	10	40	50
EVS P 101	PRACTICALS			50
	SEMESTER II			
EVS T 201	BASICS OF EARTH SCIENCE	10	40	50
EVS T 202	HUMAN ECOLOGY	10	40	50
EVS P 201	PRACTICALS			50
	SEMESTER III			
EVS T 301	NATURAL RESOURCES AND SUSTAINABLE MANAGEMENT	10	40	50
EVS T 302	CLIMATOLOGY AND SOIL SCIENCE	10	40	50
EVS P 301	PRACTICALS			50
	SEMESTER IV			
EVS T 401	FOREST AND WILDLIFE ECOLOGY	10	40	50
EVS T 402	TRIBAL ECOLOGY AND ETHNOBIOLOGY	10	40	50
EVS P 401	PRACTICALS			50
	SEMESTER V			
EVS T 501	ENVIRONMENTAL POLLUTION AND CONTROL TECHNIQUES	10	40	50
EVS T 502	ENVIRONMENTAL REGULATIONS AND TREATIES	10	40	50
EVS T 503	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM	10	40	50

EVS T 504	AQUATIC ECOLOGY	10	40	50
EVS T 505	ENERGY AND ENVIRONMENT	10	40	50
EVS T 506	NATURAL HAZARDOUS AND DISASTER MANAGEMENT	10	40	50
EVS P 501	PRACTICALS			50
EVS P 502	PRACTICALS			50
EVS P 503	PRACTICALS			50
	SEMESTER VI			
EVS T 601	ENVIRONMENTAL ECONOMICS	10	40	50
EVS T 602	ENVIRONMENTAL MICROBIOLOGY AND BIOTECHNOLOGY	10	40	50
EVS T 603	ENVIRONMENTAL STATISTICS AND MATHEMATICAL MODELLING	10	40	50
EVS T 604	ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT	10	40	50
EVS T 605	ENVIRONMENTAL HEALTH SCIENCE AND TOXICOLOGY	10	40	50
EVS T 606	INSTRUMENTATION AND ANALYTICAL TECHNIQUES	10	40	50
EVS P 601	PRACTICALS			50
EVS P 602	PRACTICALS			50
EVS P 603	PRACTICALS /CASE STUDY			50
	GRAND TOTAL			**1500**

Prof. S.Bhatnagar Prof. J.K.Jarg Prof. S. C.Santra

.

EVS T 101: BASICS PRINCIPLES OF ECOLOGY

Unit 1
Principles of ecology, Concept, rules in ecology, ecological factors and response of plants and animal life. scope and dimension of application in environmental science, environmental perspectives.

Unit 2
Ecosystems-concept, types, structure and functional aspects of major ecosystems, food chain, food web, ecological pyramids, productivity in ecosystems, stability and resilience in ecosystem.

Unit 3
Energy flow in ecosystem, laws of thermodynamics, concept of productivity, biotic interactions- positive & negative.

Unit 4
Biogeochemical cycles, Population characteristics, community characteristics and structure, ecological succession- types, causes and process.

Unit 5
Biodiversity-concepts categories, values, types of biodiversity, measurement conservation priorities, Bio geographical classification of India, biodiversity status in India, strategies for biodiversity management in India, threats of biodiversity, Endangered and endemic species of India; key stone species, Red Data Book, Hot spots of biodiversity.

Recommended Books
*Ecology and Environment ,2008-2009.P. D. sharma (Rastogi Publications, Meerut)
*Fundamentals of Ecology Eugene P. Odum, (Natraj Publishers, Dehradun.)
*Principles of Ecology P. S. Verma,V. K. Agarwal (S. Chand and Co. New Delhi)
*Ecology and Field Biology Robert Leo Smith (Harper Collins college publication)
*General Ecology H. D. Kumar (Vikas Publishing house, New Delhi)
*Elements of Ecology Brijgopal, N. Bharadwaj (Vikas Publishing house, New Delhi
*Environmental Ecology Bill Freedman (Academic Press, New York)
*Concepts of Ecology N. Arumugam (Saras Publication, Kottar, Dist. Kanyakumari)
*Concepts of Ecology E J Koromandy, (Prentice hall of India)
*Ecology: Principles and Applications, J. L. Chapman and M.J. Reiss,
*Cambridge University Press, U.K.
*Population Ecology – C. J. Creb
*Ecology – Subramanyam
*ecology principle and application – J. L. Chapman and M. J. Reiss
*Environment and Ecolgoy – Gourkrishna Dasmohapatra
*Ecolgoy – Ricklefs Miller.

.

EVS T 102: BASICS OF PHYSICAL SCIENCES

Unit 1
Components of environment biosphere; the material basis of life, evolution of life on earth, response of physical environment to living system, energy-flow and energy acquisition in biosphere.

Unit 2
Fundamental of geology, major endogenic and exogenic processes, common geological structure – bedding, fold, fault, cleavage, Soil- composition, soil profile, pedogenesis, factor affecting soil formation, types, soil erosion, soil conservation.

Unit 3
Atmosphere- structure and composition of atmosphere; evolution of atmosphere; composition of air; atmospheric temperature; atmospheric pressure; earth's radiation balance. Lithosphere- structure and composition, rocks and its types with examples, soil.

Unit 4
Hydrosphere- structure of water molecule; properties of water (physical and chemical); distribution of water on earth; global water balance (GWB); hydrological cycle.

Unit 5
Concept and scope of environmental chemistry, scope of environmental geography, environmental degradation concept, landuse impact and concept, urban and rural land use policy, land use planning .

Recommended Books

*Environmental Science – Enger, Smith and Smith W.M.C. Brown company publication
*Environmental Science - Taylar and Miller
*Environmental Science – Botkin and Kelter, John Wiley and Sons, New York.
*Environmental Science – S.C. Santra
*Environmental Science – Neble
*Environmental Science Enger Smith, Smith, W. M. C.Brown (Company Publishing
*Principles of Soil Science Watt K. E. F.(1973),(McGraw Hill Book Co., New Delhi

EVS P 101

Recommended Practicals

To study the cleaning methods of glass wears.
To study the First-Aid and emergency treatment in laboratory.
To study the laboratory equipments and instruments.
To study the preparation methods of reagents.
Identification and classification of phytoplankton's from water sample
Identification and classification of zooplankton's from water provided sample
Study of vegetation of local area/college campus
Study of fauna of local area/college campus
To find out minimum size of the quadrate for vegetation study
Study of vegetation density by quadrate method
Study of vegetation frequency by quadrate method.
To study species area curve of plant species from terrestrial ecosystem.
To study the relative density of plant/animals species by quadrate method.
To study the relative frequency of plant/animal species by quadrate method.
To study the relative abundance of plant/ animal species by quadrate method
To study species diversity of plant species from terrestrial ecosystem
To study stratification of plant species from terrestrial ecosystem.

EVS T 201: BASICS OF EARTH SCIENCE

Unit 1
Fundamentals of Geology, major endogenic and exogenic processes, geological agents of changing environment viz. tectonics, magnetism, weathering, erosion and deposition,; common geological structures-bedding, fold, faults, cleavages, sichstosity, fractures, deposits and credibility of rocks.

Unit 2
Elements-Types and its distribution and properties and behaviour. Heat transfer Process, mass and energy transfer across various interfaces, material balance, atmosphere stability.

Unit 3
Hydrology and hydrogeology, Water balance, water flow hydraulics, artificial recharge and rain water harvesting, water resource management, aquifer.

Unit 4
Geomorphology- forms and processes; mountain geomorphology and coastal geomorphology an overview.

Unit 5
Environmental degradation, concept of impact due to deforestation on land use agricultural activities and urbanization, man's modification of environmental system.

Recommended Books

*Validia.K.S, Environmental Geology, Tata Mc Grace Hills Publishing Co. Ltd. New Delhi.
*Barry and Choslay, Atmosphere, Weather and Climate, The English Language Book Society.
*A Text Book of Environmental Sciences, S. S. Purohit, Q. J. Shammi and A.K. Agarwal, Student Edition (Agrobios), Jodhpur.
*B.K Sharma – Environmental chemistry –Goeyl publication.
*Essentials of Ecology & Environmental Science, S.V.S. Rana, Prentice Hall of India Pvt. Ltd., New Delhi.
*A Text Book of Environmental Studies, D. K. Asthana and Meera Asthana, S. Chand & Co., New Delhi.
*Environmental Science, S.C. Santara, New Central Book Agency (P) Ltd.,Kolkota.

EVST 202 HUMAN ECOLOGY

Unit 1
Evolution of man, Arboreal ancestry of man. Homonids and homos. Paleolithic and hunters. Mesolithic hunter gatherers. Neolithic man and agricultural revolution, Nomadisam and agriculture.

Unit 2
Domestication of plants and animals, social evolution of man, sedentarization and the evolution of rural settlements. Classifications of settlement in relation to geographical feature of environment. Agroeconomic zones

Unit 3
Evolution of a city, urbanization and the evolution of early industrial societies, evolution of human transport and communication systems, principle of city planning

Unit 4
Evolution of industrial societies and mechanization of human industries, Cybernetic man-the evolution of information society. Impacts of mechanization of industrialization of environment, Degradation of natural environment.

Unit 5
Ecotorism, the meaning of growth and development, life style, social behavior of various human communities and impacts, Bioethics, human rights, future man, equity and justice as case values, microplannig and tribal welfare.

Recommended Books

EVS P 201

Recommended Practicals

Qualitative and quantitative study of land form and their environmental interpretation.
Study of major rocks.
Microscopic study of common rocks
Study of toposheets/ aerial photograph.
Study of geomorphic features of a watershed.
Preparation of meteorological graphs, charts or windrose.
Model study of structural folds and faults

EVS T 301: NATURAL RESOURCES AND SUSTAINABLE MANAGEMENT

Unit 1
Water resources: Surface water and ground water, watershed management, water harvesting technologies

Land resources: Land use pattern, eco generation of wastelands, soil erosion and conservation, soil reclamation.

Unit 2
Mineral resources: Types and import antes of minerals, uses and exploitation,environmental effects of extracting and using mineral resources, case studies.
Ocean resources: Biological and mineral resource of, continental and shelf and depots

Unit 3
Forest resource: Forest and environment, national forest resources, forest type's forest management, National forest policy.

Wild life resources: Wild life population pattern, Range and habitat, Endangered and rare species, National parks and Sanctuaries, Biosphere reserves

Unit 4
Agriculture resource: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizer – pesticides problems, water lodging, salinity, case studies.
Livestock resource: Livestock's resource in India an overview

Unit 5
Sustainable development: The concept of sustainable development; Environmental degradation and conservation issue; Global change and sustainability issues; Ecosystems and social processes in:

(a) Rehabilitation of degraded rural landscape,
(b) Rehabilitation of unbalanced soils,
(c) Rehabilitation of specialized habits, e.g. water bodies, mangroves,
(d) Mined area rehabilitation, Carrying capacity and regional planning.

Recommended Books

Prof. S.Bhatnagar Prof. J.K.Jarg Prof. S. C.Santra
.

*A text book of Environmental Studies.,2006.D.K.Asthana, Meera Asthana (S.Chand&Co.)
*Essential Environmental Studies,2009.S.P.Misra,S.N.Pandey,(Ane Books Pvt.Ltd,Chennai)
*Text Book of Environmental Studies, Erach Bharucha, 2005.Orient Longman Pvt. Ltd.,Ernakulam
*Principles of Environmental Biology P. K. G. Nair (Himalaya Publ. House, N. Delhi
*Environmental Biology M. P. Arora (Himalaya Publishing House, New Delhi)

EVST 302 CLIMATOLOGY AND SOIL SCIENCE

Unit 1
Understanding the meteorological parameters-temperature, humidity, rainfall; wind speed and direction, sunshine, intensity, atmospheric pressure, cloud cover and characteristics, forecasting of meteorological informations, Indian climate monitoring system.

Unit 2
Tropical monsoon-causes, and impacts, impacts of climate change on tropical monsoon.

Unit 3
Origin, nature and classification of parent materials and soil information. Composition and properties of soil components-soil minerals, soil water, soil air, soil temperature, soil reaction, soil organisms and so on.

Unit 4
Soil fertility- soil organic matter, nitrogen, phosphorus and sulphur economy in soil. Soil erosion- causes consequences, control strategies.

Unit 5
Soil health- monitoring and management. Soil pollution- sources and soil pollution management. Soil productivity and food security- an overview.

Recommended Books
*General climatology : Critichfield H. J.
*Climatology : Fundamentals and Applications : Mater J. R.
*Climatology : Selected Applications : Henry D. Foth
*Introduction to weather and climate : Trewartha
*The Atmosphere : An Introduction to Meterology : Fedrik K. Lutgen, E. J. Tarbuck
*General Meteorology : H. R. Byers (Tata Mc Grew – Hill Publications, New Delhi)
*Environmental Geography, Savindra Singh, Prayag Pustak Bhavan,
Allahabad.
*R. K. Trivedi 'Physicochemical analysis of water and soil'
*Willard ' Instrumental Methods of Analysis'

EVS P 301

Recommended Practicals

Measurement of atmospheric humidity.
Identification of different rock hand specimen for its physical properties.
Collection and preservation of different types of soil samples.
To study the physical characteristics of soil such as colour, texture, temperature etc.
To study the soil profile.
To study the water holding capacity of soil.
To study the pH of soil sample.
To study the organic matter present in soil by ignition method.
To study the NPK of Soil Samples by using soil testing kit.
Determination of water holding capacity of soil.
Determination of conductivity of soil.
Industrial visit – To study the process of manufacturing products/wastegeneration/ treatment process etc; (student should submit their industrial visit report).
Ecological data collection.
Seminar presentation and submission.
Compulsory study tour.

EVS T 401: FOREST ECOLOGY & WILDLIFEBIOLOGY

Unit 1
phytogeography and biogeography OF INDIA, Climatic Region of India and distribution of forests, geology and its impacts on forest distribution,Classification of Indian forest types, ecological principles of forest management, forest resources of India, , management-ecology and economics.

Unit 2
Growth strategies of forest tress, Fast and slow growing species, regeneration restoration and reproduction, 'r' and k selection, Diversity and dominant relationship, solitary and social trees.

Unit 3
Classification of forest for management: sanctuaries, reserves, National Parks, biospheres of India wildlife and forest act , solitary and social animals and their behaviours.

Unit 4.
Concept of wildlife, Classification of Indian wildlife, , importance of wildlife, endangered species, conservation, Management of wildlife and their habitats

Unit 5
Institutional support systems in understanding wildlife status of this country
Basic principles of wildlife management; Role of Biology in management; the need for wildlife management; Lion, Rhino etc and habitat management techniques.

Recommended books

*Essentials of Ecology & Environmental Science, S.V.S. Rana, Prentice Hall of India Pvt. Ltd., New Delhi.

*Fundamentals of Environmental Science G. S. Dahliwal,G. S. Sangha P. K.Ralhan (Kalyani Publishers, New Delhi)
*Environmental Science. V.K.Ahluwalia, Sunita Malhotra (Ane Books Pvt.Ltd,Chennai
*Forest Ecology (Vol. I&II) – G.S.Puri, P.Gupta, Oxford & 1 BH.
*Forest Policy & Law – S.S.Negi, Indus Publishing Company
*Wildlife Biology-C.H. Stevension and Arwin
*India's Wildlife and Wildlife resources – B.Seshadri sterling Publishing Pvt. Ltd.

EVS T 402: TRIBAL ECOLOGY AND ETHNOBIOLOGY

Unit 1
Ethnicity and tribes of India, major tribes of India: Nagas, Khasis, Mundas, Kols, Baigas, Bhils, Santhals and Gonds and their geographical distribution.

Unit 2
Resources and habitat relationships, forest, rivers, coasts, hills and desert population growth census, socialicity, sex ratio, social relations,rites and rituals,

Unit 3
Ecology and economics of tribal system, ecology and tribal settlement, Govt policies of developments ownership rights of forest land and resources.

Unit 4
Tribal discontent, developmental activities and displacement procedures, tribal health, education and social cases, joint forest management in tribal areas.

Unit 5
Ethnobiology –Concepts, indigenous and traditional knowledge, documentation TRIPs and biodiversity uses in tribal interest, a case study of tribal village.

EVSP 401

Recommended Practicals

Field Study:
Field study will be carried in the local areas to study the forests, estuaries, coastal

areas for understanding of climate and human impact on biodiversity.

a case study of tribal village.

Practical related to concerned papers.

EVS T 501: ENVIRONMENTAL POLLUTION AND CONTROL TECHNIQUES

Unit 1
Air pollution: Sources of air pollutants, photochemical smog, transport of air pollutants and, effect of air pollutants on vegetation, crops, human health and monuments, status of air pollution in Indian cities, air borne bio pollutants and its effect on human health, methods of air pollution control air quality management concept.

Unit 2
Water pollution: Sources of water pollutants, eutrophication, effect of water pollutants on plants, animals and human health, thermal pollution of water causes and effect, marine pollution sources of pollutants and monitoring techniques, status of water pollution in different water bodies with reference to Indian context; Water quality monitoring and water pollution control strategies.

Noise pollution: Sources of noise, effects of noise on human health, monitoring of noise pollution management & control, status of noise pollution in India.

Unit 3
Soil pollution: sources of soil pollution, nature of soil pollutants, impact of soil pollution on plants, animals and human health, soil pollution monitoring and control strategies: toxic and hazardous solid waste source and their management soil quality management concept, waste disposal & recycling technology (Fly ash, slag)

Unit 4

Environmental Modem biotechnological approaches for pollution control: Principals of pollution abatement- concepts of clean environment, basis and necessity for standards, non point and point pollution sources, Wasteland reclamation

Unit 5

Standards of various environmental parameters and industrial discharges, Air pollution abatement strategies- use of technological devices and green belt development, Biotreatment technologies, solid waste of toxic chemicals and radioactive substances; pollution abatements and public participation- cleaning river like Ganga and Yamuna. Minimum National Standards (MINIMAS) Ambient air quality, water quality for drinking and surface waters.

Recommended Books

*Air Pollution and its control : Sumit malhotra (Pointer publishers, Jaipur)
*Air Pollution : M. N. Rao (Tata McGraw – Hill publishing company, New Delhi)
*Environmental chemistrry : B. K. sharma, H. Kaur (Krishna prakashan media, Meerut)
*Air Pollution : S. K. Agarawal (A. P. H. Publishing corporation, New Delhi)
*Air Pollution : V. P. Kudesia (Pragati Prakashan, Meerut)
*A text book of Environmental Chemistry and Pollution Control': S. S. Dara
*Water pollution; causes, effects and control: Goel, P.K, New age Int Pvt. Ltd. Publishe.rs, 1997.
*Environmental pollution, Khitoliya, R.K, S.Chand andCompany Ltd, New Delhi, 2004.
*perspectives in Environmental studies, Anubha Kaushik, New Age Intl. Publ, New Delhi, - 2004.
*Environmental Sceince, Anil Tyagi, Danika publishing company, New Delhi, 2007.

EVS P 501

Recommended Practicals

Study of high volume sampler and respirable dust sampler.
Determination of acidity of water.
Determination of pH and temperature of water.
Determination of hardness of water.
Determination of carbon dioxide in water.
Detection of SO2 from ambient air.
Detection of H2S from ambient air.
Detection of Ammonia from ambient air.
Interpretation of wind rose diagram.
Determination of wind velocity.
Determination of Air pollution index.
Determination of Suspended Particulate Matter by HVAS and RDS.
Determination of Respirable Suspended Particulate Matter by HVAS , RDS Estimation of SOX from air by HVAS , RDS Spectrophotometer.
Estimation of NOX from air by HVAS , RDS Spectrophotometer.
Estimation of Ammonia from air by HVAS, RDS Spectrophotometer.
Determination of Noise Level by dB meter

EVST 502: ENVIRONMENTAL LEGISLATION INTERNATIONAL CONSERVATION AND ENVIRONMENT MOVEMENT

Unit 1

National policy statement, environment and development, National Environment Policy 2006: an overview Legislative framework of environmental protection, historical perspectives and Indian constitutional provisions.

Unit 2

Environmental acts and rules-Environmental Laws, The Water (Prevention and control of Pollution) Act 1974; The Air (Prevention and Control of Pollution) Act 1981; The Environment (Protection) Act 1986; Forest Act 1927; Forest Conservation Act 1980; The Wild life Protection Act 1972(2002 Amendment); Biodiversity Act 2002; The Noise Pollution (Regulation) 2000, Motor Vehicles Act, 1988.

Unit 3

International Conventions — Stockholm Declaration, 1972; Ramsar Convention; World Heritage Convention; Kyoto Protocol; Rio Summit (Earth Summit); Johannesberg Summit, 2002. Montreal Protocol. Biodiversity act 2002 and related rules: an overview of application in India. Convection on International trade of endangered species.

Unit 4

Sanction and enforcement bodies of environmental laws- role of high court (green bench), supreme court, State and Central Pollution Control Boards.

Unit 5
National Environmental Movement- Silent valley movement, Chipko movement, Narmada movement, Appiko movement, Almatti dispute and Tehri dam movement.

Recommended Books
*Principles of Environmental Science, Cunmingham,W and Cunmingham, M.A, Enquiry and applications, Tata Mc Graw hills publication, New Delhi, 2nd edition, 2003.
*Forest resources, Conservation and Management, Kumar, A.D, Affiliated East West press Pvt. Ltd, 2001.
*Handbook of Environmental Laws, Acts, Rules, Guidelines, Compliances and Standards, Vol. I and II, BS Publications, Hyderabad.
*Introduction to Environmental Legislation, B.L.Chavan, A.R.Shahane and C.S. Rawandale, Asian Inst. Env. Law., Karmala.
* Environmental Law, Bell Stuart & Mc Gillvray Donal, 2001, Universal Law Publishing Co.
*, Environmental Law and Policy Diwan Shyam and Rosencranz Armin, 2002. Hughes David, 1992, Environmental Law, Butterworths.
*Environmental Law Case Book Leelakrishnan. P, 2004, , Lexis Nexis, Butterworths
*Environment and Pollution Law Mohanty. S. K., 2004, , Universal Law Publishing Co. Pvt. Ltd.
*Environmental Law in India Singh Gurdip, 2004, , Mcmillan & Co.
*International Environmental Law, Singh Gurdip, 2003, in Gurdip Singh, International Law, Macmillan.

EVS T 503: REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM

Unit 1
Maps : Types, scale, minimum mapping unit, topographical features on a map, drainage, stream orders, slope estimation from contours, maps in environmental planning and management for land use/ cover, forests, landforms, settlements, and communication network

Unit 2
Remote sensing : Principle and concept of remote sensing, definition, electromagnetic spectrum, remote sensing platforms, optical, thermal and microwave sensors, interaction between light and matter, spectral signatures of plants, water, and rocks in different spectral regions, ground truth data collection.

Unit 3
Date acquisition: aerial photography, cameras, satellite data: Orbits (sunsynchronous, geosynchronous, Polar), Multispectral scanners, CCD cameras, land sat, SPOT & IRS
Imager analysis: elements of aerial photographic interpretation, stereoscopic data analysis, series of satellites,

Unit 4

Digital Data Analysis: Image characteristics, pre-processing, image classification (supervised and unsupervised), change detections, commercially available software's.
Geographical Information system: Terminology, raster and vector GIS, database creation, data storage, database standards, commercially available software's.

Unit 5

Applications of RS and GIS in forestry, Agriculture, wetlands, water resources, natural hazards (landslides, forest fire)

Recommended Books

*Textbook of Remote sensing and GIS (Third edition, 2006) by M. Anji Reddy BS Publication,
Hyderabad
* Fundamentals of remote sensing (Second edition, 2005) by George Joseph Universities press
(India) Private Ltd., Hyderabad.
* Remote sensing and image interpretation (Fifth edition, 2007) by Thomas M. Lilesand, Ralph W.
Kiefer, Jonathan W. Chapman Wiley India publication, New Delhi .
* Remote sensing of the environment (2000) John R. Jensen, Dorling Kindersley India Pvt. Ltd,
* Current sciences special issue remote sensing for national developmentVolume 61 numbers 3 and
4 August 1991
*Remote sensing for environmental sciences Erwin Schande, Springes – Verlag;; BerlingHeidelberg, New York.
*Introduction to Environmental Remote Sensing;E.C Barrett and L.F Curtis Chapman and Hall, London.
*Principles and Interpretation F. F Sabins; Remote sensing –; W.H freeman and Co. .*Remote Sensing: Principles and Applications, Sabbins, F.E., Freeman
*Remote Sensing and Image Interpretation, Lilleand, T.M. and Kieffer,
R.W., John Wiley and Sons.

EVS P 502

Recommended Practicals

1. Map reading: natural resources, settlements, slope estimation, drainage network.
2. Identification of land cover/Use classes on aerial photographs and satellite imagery
3. Image Display, enhancement
4. Georeferencing of satellite images
5. Supervised and unsupervised classification (general land use)
6. Creation of database in GIS for a small watershed.

EVEST 504 AQUATIC ECOLOGY

Unit 1
Classification of wetlands, Major physical and chemical factors (light, temperature gases, nutrients) zonation of aquatic ecosystems, Aquatic biota: Phytoplankton, Zooplankton, Benthos, Periphyton Macrophytes, Fish and other animals.

Unit 2
Lakes environment: stratification, biotic components, threats and conservation priorities. Thermal stratification, algal blooms,

Unit 3
Water pollution: pollutants monitoring and management of lakes, river and wetlands, westlands of India and Ramsar convection

Unit 4
Marine ecology , intertidal and benthic community, fisheries potential, Effects of pollution on marine life.

KINDLY EDIT THIS PAPER CONTENTS ALSO.

EVS T 505: ENERGY AND ENVIRONMENT

Unit 1
Sun as source of energy, nature of its radiation, heat budget of earth, earth tempature and atmosphere,

Unit 2
Conventional energy- sources and categories, current status of exploitation viz. coal petroleum, natural gas, nuclear fuel with references to India. Non-conventional energy-sources and categories, current status of exploitation viz. solar, wind, bio fuel, tidal, geothermal, hydal energy with respect to India.

Unit 3
Energy production consequence on environment-fossil fuel uses and non-conventional energy use, energy and climate changes issues. Energy audit- concept, purpose and methodology.Energy conservation in industry and energy planning: an overview.

Unit 4
Energy balance and cost reduction in transport and process industries. Examines the major techniques for providing energy in urban contexts - generation, transportation, usage, alternatives and environmental impacts.

Unit 5
Energy use pattern in different parts of world, India and its impacts on environment, C02 emission, air, thermal pollution, radioactivity for nuclear pollution, energy and climatic change issues.

EVES 506 :NATURAL HAZARDOUS AND DISASTER MANAGEMENT

Unit 1

Concept of hazard, disaster, risk, vulnerability, exposure and response. Distinction between natural hazards and anthropogenic environmental disturbances, Hybrid hazards.
Flood – cause nature and frequency of flood, Flood hazard, Urbanization and flooding, Flood mitigation methods.
Landslides- Causes, Types, prevention and correction.

Unit 2

Coastal hazards- Tropical cyclone and tsunamis, coastal erosion, sea level changes and impact on coastal areas

Unit 3

Geological hazards:
(a) Earthquakes- Cause intensity and magnitude of earth quakes, geographical distribution of earth zones and seismic waves, nature of destruction, protection from earthquake hazards.
(b)Tsunami causes and impact assessment,
(c)Volcanism – Nature extend and causes of volcanism volcanic volcanic materials and pollution, geographical distribution of volcanoes.
(d)Snow and avalanches

Unit 4

Various phases of disaster management- Mitigation, preparedness, response, recovery
scope of disaster management/emergency management Tools of Disaster management – Emergency Management Information Systems organization related to disaster management.

Unit 5

Disasters and Hazard Management: Human and ecological impacts; Risk assessment and vulnerability analysis; National preparedness and adaptation strategies; Hazards policies and agencies; National and International Agencies in disaster management, NDMA, NIDM, State level disaster management authorities.

Recommended Books

*Arya,A.S (1997) key note Address, Seminar on "Built Environment & Natural hazards". Indian buildings congress. February, New Delhi.
*Dr. Satendra, Disaster Management in Hills, Concept Publishing Co., New Delhi.
*D.K. Asthana and Meera Asthana, Environment: Problems and Solutions,S. Chand & Co., New Delhi
*T. N. Khoshoo Environmental Concerns and Strategies, , Ashish Publishing House, New Delhi
*R.K khitoliya and K. Venkatachalam)(1997), Urban settlements and Natural hazards.Proceedings of seminar on Natural hazards in the Urban habitat. November, New Delhi

Prof. S.Bhatnagar Prof. J.K.Jarg Prof. S. C.Santra

.

*Smith Keith, 2001, Environmental Hazards: Assessing Risk and Reducing Disaster, Routledge.

EVS P 503

Practicals

Preparation of Hazard Zonation map of India for land slides, earthquakes, floods etc.
Practicals based on concerned theory papers.

EVS T 601: ENVIRONMENTAL ECONOMICS

Unit 1
Concept of environmental economics, the economy and the environmental, cost effectiveness analysis, cost-benefit analysis.

Unit 2
National resource economics- analytical tools, supply and demand, accountings of naturals assets.

Unit 3
Pollution economics- Environmental policy analysis, command control strategies and incentive based strategies, economic valuation techniques of environmental benefits assets.

Unit 4
Terminology- Carbon tax, carbon foot print assessment, carbon trading, clean development mechanism, clean production and technology and ecomark.

Unit 5
Natural resources accounting – concepts, methods and empirical evidences. Environment and trade. Prey-Predator and supply-demand cycles.

Recommended Books

*Baumol and Oates, 1988, Theory of Environmental Policies, Cambridge University Press, Cambridge, UK.
*Freeman A.M., 2001, Measures of value and Resources: Resources for the future, Washington DC.
*Shogren, White and Hanley, 2001, Introduction to Environmental Economics, Oxford University Press, New York.
*Tietenberg. T, 2003, Environmental and Natural Resource Economics. Pearson Education, New York.
*Kumar Pushpam, 2005, Economics of Environment and Development. Arc Books New Delhi.
*Baumol, W.J. and Oates, W.E., 1988, The Theory of Environmental Policy Cambridge University Press.
*Bhattacharya, R.N. (Ed.), 2001, Environmental Economics: An Indian Perspective, O.U.P.
*Bromley, D.W. (Ed.), 1995, Handbook of Environmental Economics, Blackwell.
*Kadekodi, G.K., (Ed.), 2004, Environmental Economics & Practice, O.U.P.
*Kolstad, Charles, 2000, Environmental Economics, Oxford University Press.

EVST16: ENVIRONMENTAL MICROBIOLOGY AND BIOTECHNOLOGY

Unit 1
Biodiversity of Microbes, organisms in nature and their importance, biology and classification of bacteria, micoplasma and virus, and fungi, Microbiology of Air /soil an overview, study of microbial isolation techniques.

Unit 2
Microbes and major diseases of crop plants and human beings -Brown spot of rice stem rot of jute, Late blight of potato, cholera, typhoid and dysentery in man.

Unit 3
Environmental Biotechnology-concept and application in industry, agriculture and energy sector, Bioremediation and Phytoremediation - an overview methodology, vermiculture and biofertiliser techniques,

Unit 4
Principles of various biotechnological methods - plasmid isolation, restriction **,** Digestion, PCR, RADP, RFLP, GM crops in agriculture- prospects in India.

Unit 5
Elementary information of gene transfer, cloning, recombinant DNA technology and its implementation, microbial management of hazards.

Recommended books

*Introduction to Environmental Microbiology.Mitchell,R.1974.Prentice Hall Int.
Microbiology-M.J.Pelczar,E.C.S.Chan,N.R.Kreig.1996. Mc Graw Hill Books Co.,New york
*Microbiology-Fundamentals and Applications. Atlas,R.M.Macmillian Pub. Co.,N ew York
*A text book of Microbiology. Ananthanarayanan,R and Jayaram Panicker
*Environmental Biotechnology, M. H. Fulekar, Oxford & IBH Publishing
Co. Pvt. Ltd., New Delhi
*Mohapatra. P. K., 2006, Text Book of Environmental Biotechnology. I K International.

EVS P 601
Recommended Practicals

Study of sterilization equipments (Hot air oven, Autoclave).
Study of Laboratory equipments (Incubator, Inoculating chamber, Centrifuge).
Preparation and sterilization of culture media.
Study of Bacteria (Types).
Isolation of bacteria from Soil.
Isolation of Fungi from Soil.
Observation of motility of organisms by hanging drop technique.
Monochrome staining.
Differential (Gram's) staining.
Isolation of bacteria by Streak plate, Pour plate, Spread plate method.
Total Viable Count of Water.
Determination of Total Coliforms from water.
Determination of Fecal Coliforms from water.
Differentiation between Fecal and non fecal Coliforms by IMViC test.
Determination of Quality of Milk by Methylene Blue Reductase test.
Isolation of Azatobacter species from Soil.
Qualitative test for protein by biuret test.
Qualitative test for carbohydrate by Benedict's test.
Estimation of metabolites, chlorophyll, phenolics, protein, carbohydrate, and fat – (7)
Assay of antimicrobial activity

EVS T 603: ENVIRONMENTAL STATISTICS AND MATHEMATICS MODELLING

Unit 1
Population and samples, tabulation of data, frequency tables and frequency curves, mean, mode and median; variance and standard deviation, coefficient to variation, data presentation techniques, probability,

Unit 2
Concept of sampling; types of sampling, simple random, random sampling and stratified random sampling;,

Unit 3
Correlation and regression, concept of testing of hypothesis; tests for single mean and difference of means; Chi-square test, students t-test, and F-test. ANOVA,

Unit 4
population growth and interactions –Lotk – Voltrra model. Leslie's matrix model, point source stream pollution model, box model, Gaussian plume model, prey-predator model.

Unit 5
computer applications**:** Structure, function, capabilities and limitations of computer, computer packages, MS-Office (MS-Word, MS Excel, MS-PowerPoint) introduction to internet; applications of computer in environmental science; use of computer in environmental modeling;

Recommended books:
*Fundamental of applied statistics – S.C. Gupta and V.K. Kappor.
*Elements of statistics – Donald R. Byrkit.
*Mulitivariance analysis- Hunt and Shelly
*computer fundamentals
*computer – Newman Ed.
*computerized environmental modeling – J. Hardstay, D.M. Tailor & S.E. Metcalf
*computerized aided environmental management – S.A. Abbassi and F.I. Khan.
*Biostatistics M.P. Arora & P K Malhan Himalya publication

Prof. S.Bhatnagar Prof. J.K.Jarg Prof. S. C.Santra
.

*principle of biostatistics Satguru Prasad

EVS P 602
Recommended Practicals

Calculation of mean, mode and median from data.
Calculation of standard deviation from data.
Calculation of variance from data.
Calculation of standard error (SE) from data.
Problems on correlation coefficient.
Problems on probability.
Problems on t- test.
Problems on z-test.
Problems on F- test.
Problems on ANOVA.
Problems on chi-square test.
Problems on Regression equation.
MS-Word
MS-Power Point.
MS – Excel
Introduction of internet.

EVST 604: ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT SYSTEM

Unit 1
Environmental Assessment process, objectives of EIA, terminology, Hierarchy in EIA, framework of EIA,

Unit 2
Techniques and Methods in EIA Evaluation of impacts - different methods (checklist, adhoc, overlays, matrix, network and Bettle Environmental Evaluation Systems) -. risk assessment, environmental clearance for establishing an industry.

Unit 3
case studies of EIA for thermal power, Iron and steel industry, road, dams, mining projects:

Unit 4
Introduction and scope of environmental management, environmental management plan, environmental safety, risk management and emergency preparedness, post project monitoring., environmental planning concept legal and administrative framework.

Unit 5
Definition of Environment Audit and its importance for Industries. Types of audits, General audit methodology and basic structure of audit. Elements of an audit process and its importance. Concept of 1SO14000, life cycle analysis,

Recommended books:
*Larry W. Canter," Environment Impact Assessment", McGraw-Hill Book Company, New York
*G.J. Rau and C.D. Weeten, "Environmental Impact Analysis Hand book, McGraw Hill, 1980.
*Vijay Kulkarni and T V Ramchandra. “Environmental management” Capital Publishing Co
*Mhaskar A.K., “Environmental Audit" Enviro Media Publications.
*Glasson J., Therivel R., Chadwick. A., 1994, Introduction to environmental impact assessment- Principles and procedures, process, Practice and prospects. Research Press, Delhi.

Prof. S.Bhatnagar Prof. J.K.Jarg Prof. S. C.Santra
.

*Morris. P. & Therivel. R., 2001, Methods of environmental impact assessment, 2nd Ed. Spon Press, New York, With a chapter on GIS and EIA by A.R. Bachiller & G. Wood, p. 381-401.
*Petts Judith, 1999, Handbook of environmental impact assessment. Vol. 1, Blackwell Science.

EVST 605: ENVIRONMENTAL HEALTH SCIENCE & TOXICOLOGY

Unit 1
Concept of toxins, toxicity and toxicology, Classification of toxic compounds, Dose effect and Dose response relationship, levels of toxicity – acute, sub acute and chronic, Types of toxicants, classification of toxicants – factors that affect environmental concentration of toxicants. Chemical and biological factors influencing toxicity.

Unit 2
Concept of LC 50, LD 50 and ED 50. Biotransformation, bio magnification, bio concentration, bio accumulation, bioactivation toxicants in ecosystem. Bioassay methods using plants and animal model.

Unit 3
Environmental health-Basic concept, physiological responses of man to relevant stresses in the environment, industrial toxicology and its relationship with occupation and hygiene and also diseases.

Unit 4
Epidemiological study-Concept, monitoring techniques with respect to Arsenicosis and Flouorosis, vector borne disease. Environmental risk evaluation and evaluation and management: an overview.

Unit 5
Principles and methods of occupational health. The relationship of occupation of hygiene and safety and disease. Health maintenance: Survey, analysis and recommendations regarding health and safety problems in the working and living environment.

Recommended books:
*P.D.Sharma, Environmental biology and toxicology, 1997-98.
*P.K.gupta and D.K.Shinlee, Modern toxicology
*G.C. Butler, Principles of Eco toxicology

Prof. S.Bhatnagar Prof. J.K.Jarg Prof. S. C.Santra

.

*Duffus, John H, Environmental toxicology
*Shukla J.P and Pandey, Elements of Toxicology, Radha publ., New Delhi.
*Cockerham L.G and Shane B.S, Basic Environmental Toxicology, CRC press, Bocaraton, USA.
*Newman, M.C, Lawrence, C.A., and Unger. M.A., 2002. Ecotoxicology: Fundamentals of
*Ecotoxicology, 2nd Ed., CRC Press, Boca Raton, Florida.
*Walker, C.H., Hopkin, S.P., Sibly, R.M., and Peakall, D.B. 2001. Principles of Ecotoxicology. 2nd Ed. Taylor & Francis, London. 36
*Moore, G.S., 2002, Living with the Earth: concepts in Environmental Health Science (2nd Ed.), Lewis publishers, Michigan.
*Newman, M.C, Lawrence, C.A., and Unger. M.A., 2002. Ecotoxicology: Fundamentals of Ecotoxicology, 2nd Ed., CRC Press, Boca Raton, Florida.

EVST 606: INSTRUMANTATION AND ANALYTICAL TECHNIQUES IN ENVIRONMANTEL SCIENCE

Unit 1
Soil sampling techniques, preservation, storage and processing techniques. Basic principle of autoclave hot air oven, Microbial isolation techniques, Principals and application of titrimetry, gravimetry, potentiometry, spectrophotometry analysis and their application.

Unit 2
Air quality sampling and analysis- techniques and applications. water quality sampling, storage, processing and analysis- techniques and applications. Principals of chromatography analysis and their application, Principals of gel electrophoresis techniques and their application, Radioactivity detection techniques and application: an overview.

Unit 3
application of Spectrophotometry (UV-Visible spectrophotometry), Titrimetry, Gravimetry, Colourimetry, NMR, ESR, Microscopy-phase, light and flourscence microscopes, Scanning and Transmission electron microscopes.

Unit 4
Chromatographic techniques (Paper chromatography, thin layer chromatography, ion exchange chromatography, Column chromatography), Atomic absorption spectrophotometry.

Unit 5
Electrophoresis, solid and liquid scintillation, X-ray florescence, Xray diffraction. Flame photomtery, Gas-liquid chromatography, High pressure liquid chromatography - auto radiography, Ultracentrifugation.

Recommended books:
*****Chemical & Biological Methods for Water Pollution Studies, R.K. Trivedy and P. K. Goel, Environmental Publications, Karad.

*Handbook of Methods in Environmental Studies, Vol. 1 & 2, S. K. Maiti, ABD Publishers, Jaipur
*Practical Methods in Ecology and Environmental Science, R. K. Trivedy and P.K. Goel, EnviroMedia, Karad.
*Standard Methods for the Examination of Water and Wastewaters, American Public Health Association, Washington, DC.
*Manivasakam,N. Physicochemical examination of water sewage and industrial effluents, Pragatiprakasan, Meerut
*Trivedi,P.R. and Raj Gurdeep. Environment, water and soil analysis, Akashdeep Publ.,New Delhi
*Kanika Sharma,2008.Manual of Microbiology-Tools and Techniques, Ane Books India
Cappucino,J.G. and Sherman.N.Microbiology A Laborotory Hand Book3.

EVSP 603

- Safety in social life: Case studies - Identification, measurement (water, air, noise, soil, food etc.)
- Demonstration of Mock Drill (industrial visit)
- Evaluation of LC 50 using available heavy metal on the organism (fish/prawn/crab/mollusks etc.)

- Evaluation of toxicity of industrial waste on seed germination and statistical interpretation of data
- Estimation of protein levels from various body parts (intestine/gills/muscells) using Lowris method
- Estimation of carbohydrates from exposed seeds by Anthrone method
- Estimation of total chlorophyll (a,b,c) from control and exposed plant

- Field work and Project from concerned papers.