

Institute of Environment & Development Studies Bundelkhand University, Jhansi

Ordinances and Scheme of Examination for PG programme- M. Sc. In Environmental Sciences (Academic Session 2011 Onwards)

This academic course will run in the Department of Environmental Sciences under the Institute of Environment & Development Studies. It will be two years course based on semester system of Examination.

Degree – Master of Science in Environmental Sciences

Eligibility for Admission –

A candidate who has passed his/her graduation course in Environmental Sciences/Biological sciences/chemistry/earth sciences/agriculture with 50% marks in aggregate from any recognized Indian University/Institute or any other recognized organization is eligible to seek admission in M. Sc. Environmental Sciences.

- (a) Minimum qualification required for admission to the academic programs shall be as provided in the academic bulletin, acquired from any University/Institute in India or abroad, recognized by this University.
(b) Those appearing in the final year of the qualifying examination shall also be eligible to apply, provided that they submit specific proof of having passed the final year examination, with minimum requirement, at the time of admission/ personal interview, if qualified and called for.
- PROCEDURE OF ADMISSION: Admission to eligible candidates will be given strictly on merit, drawn on the basis of merit in the Common Admission Test for Environmental Sciences or as per procedure decided by appropriate authorities of the University.
- NORMAL INTAKE: The intake for the various academic programs will be as provided in the academic bulletin of each academic year. Statutory reservation, as applicable, shall be applied as per rules.
- MEDIUM OF INSTRUCTION shall be English.
- METHOD OF TEACHING in the academic program will consist of a combination of class lectures by the regular faculty, in-house visiting faculty and visiting faculty from other academic institutions/ organizations. Tutorials, Seminars, Site visits and Project-work shall be essential components of the curriculum. Quality study material will also be supplied besides computer-aided instructions and audio-visual teaching methods.
- ATTENDANCE: Minimum attendance required to be eligible to appear in the examination shall be 75% of all class lectures (theory & practical), seminars, tests, tours and project work taken together for all papers and also for each paper separately. In case a student is short of attendance due to illness, participation in sports and extra-curricular activities etc., the following shall apply:
 - A shortage of up to 5% shall be condoned by the HOD on the specific recommendations of the class teacher.
 - The Vice-Chancellor, on the specific recommendations of the HOD, shall condone a shortage of up to 10%.
 - A shortage of up to 25% may be condoned by a committee constituted by the appropriate authority of the University, on medical grounds.

7. SCHEME OF EXAMINATIONS

M. Sc. in Environmental Sciences shall be a two-year full time course comprising four semesters. Each semester shall consist of 90 teaching days including theory, practical, seminar, Sessional and educational tour. Educational tour/training courses will be carried out at particular institutes and industrial areas.

All the papers will carry 100 marks. All theory, practical, (except dissertation – 150 marks) papers will be of 100 marks and will be organized in following manner:

External assessment/examination	:	70 marks
Internal assessment	:	30 marks

Total	:	100 marks (for each paper)

The theory question papers (of 70 marks) will consist of short-answers (Section – A : 28 marks) and descriptive type (Section – B : 42 marks), and will be set by paper setter/ examiner. A model question paper will be supplied to every paper setter for apprising about the likely pattern of questions.

- Semester Examination: the University shall conduct it, normally after completion of 90 days of teaching. The question paper will be set by the Examiners, appointed by the Vice-Chancellor from the names recommended by the Board of Studies. It shall be a general policy that 50% of the theory papers in each year shall be external.
- Practical Examination: in each year a practical Examination (including practical records/Internal assessment and viva - voice) based on course contents offered in the each year shall be conducted. The Vice-Chancellor will select both the external and internal examiners from the names recommended by the Board of Studies. Similar scheme will be followed for the examination of Project work/ Dissertation.

(c) Minimum Passing Marks:

40%: - Qualifying marks
50% and above - Second Division
60% and above - First Division
75% and above – Distinction

The student will have to clear all the papers, separately with 40% marks in aggregate. In case a student fails to clear any one or more of the papers, he/she shall be given a second chance to clear the backlog by taking a back-paper examination, which shall be conducted separately or along with the annual examination at the end of academic examination in which the said course is being offered. In the meantime, the student will be given provisional admission in the next academic session.

A student will have to clear all the papers by the end of the final year/degree program in order to be eligible for the award of the relevant degree by the University.

In case a student is unable to clear all the papers by the end of the course, he/she may be allowed to reappear, in subsequent examinations, as an ex-student, without undergoing a repeat of regular academic programs. They shall be required to appear and clear only those papers; practical in which they could not secure minimum pass marks. The marks in subject already cleared shall be carried over as such.

Course Structure (YEAR 2011 onwards)

Course Structure of M. Sc. Environmental Sciences shall be as below:

Semester I : 550 marks (Plus 25 marks)#

DES- 101 : PRINCIPLES OF ENVIRONMENT & ECOLOGY (100)
DES- 102 : ENVIRONMENTAL CHEMISTRY (100)
DES- 103 : ABIOTIC ENVIRONMENT (100)
DES- 104 : NATIONAL & GLOBAL ENVIRONMENTAL ISSUES (100)
DES- 105 : CASE ASSIGNMENT, PRACTICAL & SEMINARS (150)
: STUDY-TOUR REPORT (25)

Semester II : 550 marks

DES- 201 : BIOLOGICAL PROCESSES & SYSTEMS (100)
DES- 202 : ENVIRONMENTAL POLLUTION & CONTROL (100)
DES- 203 : BIODIVERSITY – FORESTRY & WILDLIFE (100)
DES- 204 : ECOTOXICOLOGY & ENVIRONMENTAL HEALTH (100)
DES- 205 : CASE ASSIGNMENT, PRACTICAL & SEMINARS (150)

Semester III : 550 marks (Plus 25 marks)#

DES- 301 : EIA , AUDIT AND DISASTER MANAGEMENT (100)
DES- 302 : ENVIRONMENTAL MANAGEMENT & POLICY (100)
DES- 305 : CASE ASSIGNMENT, PRACTICAL & SEMINARS (150)
: STUDY-TOUR REPORT (25)

Specialization: Environmental Biotechnology

DESB-303: ELEMENTARY BIOTECHNOLOGY (100)
DESB-304: APPLICATIONS OF BIOTECHNOLOGY IN ENVIRONMENT (100)

Specialization: Natural Resource Management

DESN-303: PRINCIPLES OF RESOURCE COSERVATION AND MANAGEMENT (100)
DESN-304: NATURAL & SOCIO-ECONOMIC RESOURCE MANAGEMENT (100)

Semester IV : 300 marks

DES- 401 : DISSERTATION/ PROJECT WORK/ REPORT (300)
100 marks for dissertation evaluation; 25 marks for seminar and 25 marks for viva-voice based on presentation.

: Student must submit study-tour report of total 50 marks (preferably, 25 marks and 25 marks in 1st and 3rd semester respectively) during the two years of M. Sc programme.

SEMESTER – I : M. Sc. Environmental Sciences

Semester –I : 550 marks (Plus 25 marks)#

DES – 101 : PRINCIPLES OF ENVIRONMENT & ECOLOGY

- Unit – I : The multidisciplinary nature of Environmental Studies – definition, scope and importance; Human ecology and human settlement.
- Unit – II : Concepts of dynamics of ecosystem; Structure & functions; Abiotic & biotic components, Factors; Food chains, Food web, Energy flow, Ecological pyramids, types and diversity, productivity and biogeochemical cycles, Ecological succession, Population ecology, Community ecology and parasitism, Prey-predator relationships; Concept of habitat and ecological niches, limiting factor, carrying capacity; Ecosystems and biomes.
- Unit – III : Evolution, origin of life and speciation; Theories of organic evolution, Hardy Weinberg genetic equilibrium, Genetic polymorphism and selection; Origin and evolution of economically important microbes, plants and animals.

DES - 102 : ENVIRONMENTAL CHEMISTRY

- Unit – I : Fundamentals of environmental chemistry, stoichiometry, laws of thermodynamics, oxidations, reduction,
- Unit – II : Atmospheric chemistry, structure and composition of atmosphere, Particles, ions, and radicals in the atmosphere. Chemical processes for formation of inorganic and organic particulate matter. Thermo chemical and photochemical reactions in the atmosphere. Oxygen and ozone chemistry, photochemical smog, acid rain.
- Unit – III: Soil and water chemistry, Physico-chemical characteristics of water, Physical and chemical aspects of inland water bodies like lakes, streams, river and wetlands, heavy metals in water, pesticides, organic pollutants, inorganic and organic components of soil, nitrogen pathway and NPK in soil

DES - 103 : ABIOTIC ENVIRONMENT

- Unit - I : Origin of earth, Geological time scale, Lithosphere, Structure and composition of lithosphere, Rocks, Tectonic framework of India; Plate-tectonics, Volcano, Soil profile, soil formation and humus, Physical, chemical and biological properties of soil, Soil erosion, Mineral reserves and resources, Soils of India, Wastelands, Major natural hazards – flood, drought, earthquake, tsunami, cyclone, landslides, etc.; concept of isostasy.
- Unit - II : Atmosphere: Atmospheric profile and composition, Physical characteristics, Climatology, Types of wind, Wind as ecological factor, Climate of India, Meteorological analysis, Inversion, Climatic change.
- Unit - III : Hydrosphere: General description, Physical and chemical properties of water, Global water balance & Ice sheet, Distribution & precipitation, Water as an ecological factor, Hydrological cycle, Water resources – oceans, surface and ground water.

DES - 104 : NATIONAL & GLOBAL ENVIRONMENTAL ISSUES

- Unit - I : Global climatic change, acid rain, Ozone layer depletion, El-nino, International treaties, protocols and conventions on emission reduction, ozone layer protection and transboundary movement of hazardous waste. United Nation's efforts for environmental protection & sustainable development, Other international and national organizations for environmental protection, environmental movements, biodiversity, Agenda –21 (from unsustainable to sustainable development).
- Unit - II : Oil pollution, GAP, National Lake conservation programme, Some environmental fragile areas, Desertification & its control, Water crisis & conservation of water, Epidemiological issues (related to Arsenic, Fluoride, Silica and iodine.), environmental remote sensing, principle and application.
- Unit - III : National environmental problems, National calamities (earthquake and floods), Different environmental episodes, Population explosion and birth control measures, Energy crisis, Conventional & non-conventional sources of energy, Biosafety issues, Eco-ethics, Rehabilitation & resettlement problems, Urban problems related to energy, Environmental education & awareness, Community participation, role of women in environmental awareness.

DES- 105 : CASE ASSIGNMENT, PRACTICAL, LOCAL FLIED TRIP & SEMINARS (150)

- #: Study-tour report (25)

SEMESTER –II : 550 marks

Semester – II: M. Sc. Environmental Sciences

DES – 201 : BIOLOGICAL PROCESSES & SYSTEMS

- Unit – I : Biochemical ecology : Elements of Biochemistry; Principles of physical chemistry (Kinetics, dissociation & association constants), Nucleic acid structure & functions; Genetic code; Energy yielding pathways & metabolism; Proteins. Protein synthesis; Nitrogen metabolism; Lipids, Enzymes & coenzymes; vitamins and biological clock; processes of fatty acid oxidation, carbohydrates.
- Unit – II : Stress ecology : environmental stress and adaptations; Active transport across membranes; Plant & animal hormones; Nutrition, Reproduction, Learning & behavior; Effects of stress on plant anabolism & catabolism; Effects of CO₂ & UV; Water balance; Photo-regulation; angiospermic seeds, seed germination, anatomy and seed dormancy.
- Unit – III : Microbial ecology : Microbes – classification & significance; Mineral growth & nutrition; Food, medical, industrial & soil microbiology; Culture & media; Fermentation; Control agents of microbes; Role of microbes in soil; Water & degradation of xenobiotics; Recent issues in microbiology.

DES – 202 : ENVIRONMENTAL POLLUTION & CONTROL

- Unit – I : Air pollution classification, sources and monitoring, effects (on plants, animals, human & ecosystem levels) ; Air pollutants transport & Dispersion; Major air pollution episodes; Indoor air pollution; Air pollution control technologies.
- Unit – II : Water pollution : sources, types, effects on aquatic systems, health; Pollution of Rivers & lakes; Monitoring; Standards; Ground water contamination, Water pollution prevention & control, Effluent treatment processes; Resource recovery.
- Unit – III : Problem and sources of wastes; Solid waste – sources, characteristic & management; Fly ash management, Hazardous waste management; Waste to energy options; Land pollution & mitigation; Noise pollution – sources, monitoring, effects; Noise prevention, control and standards, thermal pollution, nuclear pollution and marine pollution.

DES – 203 : BIODIVERSITY – FORESTRY & WILDLIFE

- Unit – I : Biodiversity –definition, levels and types of biodiversity; Value of biodiversity; Threat to biodiversity; Biodiversity conservation- In-situ & Ex-situ; conservation through biotechnology, Gene pool, Conservation through legal aspects; Biodiversity at Global & National level; Future strategies for India; Bio-geographical classification, Hot-spots of Biodiversity.
- Unit – II : Forest ecology, Role of vegetation in nature; Forest types of India; Forest management & conservation; Silviculture, Rangeland management, Minor Forest Produce, JFM, Agro-forestry, Wastelands.
- Unit – III : Importance of wildlife; Common flora and fauna in India; Endangered and threatened species; Protected Areas; National Parks and Sanctuaries; Role of National and International organizations for protection of wildlife; Biodiversity Laws.

DES – 204 : ECOTOXICOLOGY & ENVIRONMENTAL HEALTH

- Unit – I : Toxicants & toxicology; Pathological problems peculiar to ecotoxicology; Dose-response relationship; Exposure assessment; Influence of ecological factors on effects of toxicity; Somatic & germinal effects.
- Unit – II : Bioaccumulation, biotransformation, Biomagnification, Biodegradation (with examples); Mutagenesis & carcinogenesis; Biomonitoring.
- Unit – III : Effect of toxicants on individual species, community & ecosystem level; Occupational health; problems, safety, chemical hazards; Environmental health – air, water, food & soil borne diseases; Prevention & control.

DES- 205 : CASE ASSIGNMENT, PRACTICAL & SEMINARS

Semester – III: M. Sc. Environmental Sciences

Semester - III : 550 marks (Plus 25 marks)#

DES -301: EIA, AUDIT & DISASTER MANAGEMENT

- UNIT-I: Generalized approach to impact analysis; concept of significant effect; Development of EIA; Elements of EIA; Procedures for reviewing EIA & statement; Methodologies of EIA; Models used in EIA; Public participation of EIA; Assessment of impacts on resources due to energy generation projects, dams, mining, cement industries, fertilizer plants, tourism, highway projects, port ad harbors.
- UNIT-II: Environmental audit- approach & methodology; concept of Eco-audit; Industrial safety audit; ISO 14000 & 18000 series; Total quality management (TQM); Ecological footprints, disaster management bill.
- UNIT-III: Basic concept of disaster; natural & technological disaster; disaster profile of India; Institutional framework & disaster management in India; Natural hazards and their zoning & risk assessment; Role of media, government and Non government agencies in disaster management; Emergency planning, preparedness, responses, organization; floods, landslides, earthquakes, volcanoes, avalanche, etc.

DES - 302 : ENVIRONMENTAL MANAGEMENT & POLICY

- Unit – I : Environmental Protection – issues and problems; International & national efforts for Environmental protection; Issues involved in enforcement of environmental legislation; Constitutional Provision of India regarding Environment ((Article 48 A, 51A and 21). Policy strategies in pollution control & Conservation; Wildlife Protection Act; Forest Conservation Act 1980; Indian Forest Policy.
- Unit – II : Environmental management in industries; Industrial estate planning; Urbanization & municipal environmental issues; Rural environmental problems & solutions; Basic concepts & technique of remote sensing; GIS application in environment, agriculture, forestry & land use planning; Indian remote sensing programme and future strategies; Principles and practice of statistical methods in biological research, Basic statistics, Coefficient of variation, Standard error, Probability distribution, Test of statistical significance, Simple correlation of regression etc.
- Unit – III : Air (Prevention and Control of Pollution) Act and Rule 1982; Provision in Motor Vehicle Act; The Water (Prevention & Control of Pollution) Act and rules (1974; 1980). The Environment Protection Act and Rules; Rules on Hazardous Wastes & management rules, Ozone Protection; biomedical waste management and handling rules, MSW, etc; Scheme of labeling of Environmentally friendly products (Ecomark); Public Liability Insurance Act 1991. International Treaties & Convention on Climate change, biodiversity, hazardous wastes etc.

DES- 305: CASE ASSIGNMENT, PRACTICAL & SEMINARS

SPECIALIZATION: ENVIRONMENTAL BIOTECHNOLOGY

DESB - 303 : ELEMENTARY BIOTECHNOLOGY

- Unit - I : Scope of environmental biotechnology; Recombinant DNA technology; c-DNA; Genomic library; Plasmid Vectors; Cosmid vectors; Retrovirus; Vector for plants; Single celled proteins; Alleles; Heteroploidy; Euploidy; linkage;
- Unit - II : Dot Blot technique; Northern blot; Southern blot; Slot blot; DNA finger printing Western blot; Radio immuno assay; PCR; ELISA Test; SDS-PAGE; Hybridoma technique; Gene therapy; Cloning.

Unit - III : Transgenic plants; Plant tissue culture; somatic hybridization; Germplasm conservation: genetic erosion and genetic conservation; Plant genetic resource; Plant virus vector; Gene bank; Cry preservation; genetically engineered microbes; Human Genome project; present status and future prospects of biotechnology in India.

DESB – 304 : APPLICATIONS OF BIOTECHNOLOGY IN ENVIRONMENT

Unit-I: Basic of environmental biotechnology; Scope of biotechnology in pollution control; Wastewater treatment: aerobic and anaerobic; Bioremediation for hazardous waste and xenobiotic waste; Microbes use in mining and oil recovery; Bio-indicator for environmental quality monitoring.

Unit-II: Environmental biotechnology and sustainability; Biocontrol agents: Biopesticide, Bioherbicides, Bioinsecticide; Biofertilizers; Biofilms; Biochips; Mushroom cultivation; VAM; Vermiculture and organic farming.

Unit-III: Bioresources: biomass as energy resource, Biogas, Bioethanol, bio-hydrogen; Biobutanol, Biodiesel; Microorganism as energy source; Environmental variation: genetic variation, acclimatization, plant introduction.

SPECIALIZATION: NATURAL RESOURCE MANAGEMENT

DESN - 303 : PRINCIPLES OF RESOURCE CONSERVATION AND MANAGEMENT

Unit - I : Introduction to natural resources; classification of natural resources; Resources management: Preservation, Conservation & Restoration; Extrinsic and intrinsic environmental resource potential values (the five E's); Patterns of resource depletion; Problems with past resource management.

Unit - II : Conservation: Reducing the need for resources; Resource economics; Jobs and life in a sustainable world; The Human population challenge (Earth's carrying capacity); Biodiversity conservation; Conservation of water resources; Conservation of water and mineral resources; Sustainable use of Energy resources; Conservation of Soils.

Unit - III : Conversion from gasoline to ethanol; Use more methane fuel, Use genetically engineering methods to develop gasoline plants; Halt the deforestation in the tropics, Reforestation; Energy intensity index; Law of diminishing returns; Approach to Natural Resource Management: Exploitation, Preservation, Utilitarian approach, Sustainable approach; Watershed management; Wasteland management, Wetland management; Rain water harvesting.

DESN – 304 : NATURAL & SOCIO-ECONOMIC RESOURCE MANAGEMENT

Unit – I : Resources – Renewable & Non-renewable; Depletion of Natural resources; Water resources & environment: Global water balance, Ice-sheets and fluctuations of sea levels; Types of water, Origin and composition of sea water, Hydrological cycle, Factors influencing the surface water, Human use of surface & ground waters. Mineral resources & environment: Resources & reserves, Minerals & population; Ocean as new areas for exploitation of mineral resources; Ocean ore and recycling of resources; Environmental Impact of exploitation, processing and smelting of minerals.

Unit – II : Forest Resource: Use and over exploitation, deforestation, Timber extraction, Mining, Dams and their effects on Forest & Tribal people; Food resources; Energy resources; Land resources and their management.

Unit – III : Role of an individual in conservation of natural resources; Equitable use of resources for sustainable life styles; Urban problems related to energy; Rain water harvesting. Resettlement and rehabilitation of people, its problems and concerns; Environmental ethics, issues and possible solution; Population growth, explosion, family welfare programme, Value education, Human Rights, Women & Child Welfare, HIV / AIDS.

SEMESTER – IV: M. Sc. Environmental Sciences

Semester –IV : 300 marks

DES – 401: DISSERTATION PROJECT - Evaluation/Viva/Seminar (300)

1. A candidate who has discontinued the academic program during any year/semester may on the recommendation of the HOD be permitted by the Vice-Chancellor to take re-admission in the academic program at the beginning of the semester/year concerned, in a subsequent year, not however beyond a gap of two years. Fee once paid shall not be adjusted or refunded during subsequent admissions.
2. Subject to the statutes and ordinances of the University. The students shall remain under the control of Coordinator or Head of the department.
3. The course fee and examination fee shall be decided by the University from time to time and will have to be deposited by the candidate, as and when asked for.
4. The academic programs may be conducted in collaboration with any institution where necessary facilities are available.
5. Above rules are subject to amendment by appropriate authorities of the University from time to time, as and when deemed necessary.
6. In view of the need in the actual implementation of the course, the adaptations and amendments, if any, by the Board of Studies, or the Expert Committee appointed by the Vice-Chancellor for the respective course/subject, for the first ordinances, shall be deemed passed and hence incorporated.