GAUHAI UNIVERSITY
Three Years Degree Syllabus in Environmental Science
General Course

Course Structure

Course Code	*Course Title*	Credits	Marks		
			External Evaluation	Internal Evaluation	Total
	SEMESTER – I				
ESG-1.1	Introduction to Environmental Science (I)	6	60	15	75
	SEMESTER – II				
ESG-2.1	Introduction to Environmental Science (II)	6	60	15	75
	SEMESTER – III				
ESG-3.1	Environmental Pollution (I)	4	40	10	50
ESG-3.2	Practical	4	40	10	50
	SEMESTER – IV				
ESG-4.1	Environmental Pollution (II)	4	40	10	50
ESG-4.2	Practical	4	40	10	50
	SEMESTER – V				
ESG-5.1	Environmental Problems and Natural Hazards	8	80	20	100
ESG-5.2	Practical	8	80	20	100
	SEMESTER – VI				
ESG-6.1	Environmental Monitoring and Management	8	80	20	100
ESG-6.2	Practical and Project Work	8	80	20	100
	Total	60	600	150	750

SEMESTER – I

ESG-1.1: Introduction to Environmental Science (I) – 6 credits **75 marks**

Unit 1: Environment: Definition, Environmental Factors – Biotic and Abiotic, Global Environment and its segments – atmosphere, hydrosphere, lithosphere and biosphere
Environmental Science – meaning, scope and importance — 10 marks

Unit 2 : Atmosphere : Structure, composition and classification; Weather and climate, Weather Elements – atmospheric pressure, temperature, relative humidity, precipitation, wind; Major climatic Zones of the world, Climate of India — 15 marks

Unit 3 : Hydrosphere : Importance and characteristics, Zones of hydrosphere, Different kinds of sources of water – Ice-cap, oceans, rivers, lakes, pond and ground water; Hydrologic cycle; Water as a resource and its availability. — 15 marks

Unit 4: Lithosphere: Earth's crust and its composition, Different kinds of rocks, Major landforms, Soil – formation and classification — 15 marks

Unit 5: Biosphere: Definition and extent, Biomes – Tundra, Taiga, Temperate and Deciduous forest, Grassland, Desert, Tropical rain forest; Habitat and Niche; A short introduction to biogeography — 20 marks

SEMESTER – II

ESG-2.1: Introduction to Environmental Science (II) – 6 credits **75 marks**

Unit 1: Ecology : Meaning and scope, Adaptation, evolution and classification of organisms, Ecosystem, food chain, food web, trophic level and population stability, Energy and nutrient flow through ecosystem, Bio-geo-chemical cycles — 15 marks

Unit 2: Major Ecosystems : Forest ecosystem, Grassland ecosystem, Wetland ecosystem and Agro-ecosystem — 15 marks

Unit 3: Natural resources: Various types of natural resources, Renewable and non-renewable resources, depletion and conservation of natural resources. — 15 marks

Mineral, forest and water resources of India with special reference to Northeast India - their depletion and exploitation

Unit 4: Energy and Environment: Various kinds of energy sources, their availability, uses and classification. 15 marks

Unit 5: Human population and Environment: Biological growth curves and carrying capacity, Human population growth and migration, Factors responsible for rural and urban population growth, Human impact on ecosystems. Population growth and distribution in India and World with special reference to Northeast India 15 marks

SEMESTER – III

ESG-3.1: Environmental Pollution (I) – 4 credits **50 marks**

Unit 1: Introduction to Environmental Pollution : Definition, causes and types – air, water, soil, noise, radioactive and thermal; Global and regional perspectives of environmental pollution 10 marks

Unit 2: Air Pollution : Causes of air pollution, Some important pollutants of air (CO_X, SO_X, NO_X and HC and Particulates) – their sources and effects on living and non-living organisms. Photochemical Smog: Definition, formation and types. 10 marks

Unit 3: Atmospheric Stability and Air pollution: Lapse rate of temperature, temperature inversion and atmospheric stability, Dispersion of gaseous pollutants, Effects of atmospheric stability on pollutant dispersion – plume types. 10 marks

Unit 4: Water Pollution : Sources of pollution of surface and ground water, Water pollution parameters – physical, chemical and biological; Types of water pollutants. Effects of water pollution on water bodies and aquatic life, vegetation and human health 10 marks

Unit 5: Water Quality Criteria; Water treatment – fundamentals, Primary, Secondary and Tertiary Treatment 10 marks

ESG-3.2: Practical – 4 credits **50 marks**

1. Handling of Meteorological instruments
2. Drawing of Hythergraph and Climograph
3. Determination of Total Dissolve Solids and Suspended Solid.
4. Study of variation of pH of water with temperature.
5. Determination of Chlorides of water
6. Determination of minimum size and number of quadrate.
7. Estimation of frequency, density and abundance of Species in a grassland ecosystem by quadrate method.

SEMESTER – IV

ESG-4.1: Environmental Pollution (II) – 4 credits **50 marks**

Unit 1: Soil Pollution – Physical, Chemical, Mineralogical and Biological properties of soil, sources of soil pollution, Pollution and residual toxicity from the application of insecticides, pesticides and fertilizers; Soil erosion and land degradation 10 marks

Unit 2: Solid Waste – Sources, characterization, disposal and management 10 marks

Unit 3: Nonmaterial Pollution : Noise pollution – source, effects and control; Thermal pollution - causes, effects and control 10 marks

Unit 4: Radioactive pollution : Radioactive materials, Sources of radioactive pollutants in our environment, Effects of radioactive pollutants on plants and animals 10 marks

Unit 5: Control of Environment Pollution – Monitoring of air quality parameters - methods, equipments, standards; Monitoring of water quality parameters - methods, equipments, standards; Control of soil pollution 10 marks

ESG-4.2: Practical – 4 credits **50 marks**

1. Study of variation of Conductivity of water with temperature
2. Determination of Dissolved Oxygen of water
3. Determination of transparency and turbidity of water

4. Analysis of Particle size of soil by hydrometer method.
5. Determination of water holding capacity of soil.
6. Determination of leaf area index by Planimeter Method
7. Estimation of canopy cover and basal cover by different species in grassland ecosystem by point frame method.

SEMESTER – V

ESG-5.1: Environmental Problems and Natural Hazards – 8 credits **100 marks**

Unit 1: Natural and Man made Environmental Problems : Environmental problems associated with urbanization, industrialization, modernization of agriculture and their regional and global perspective — 10 marks

Unit 2: Environmental problems due to Resource Exploitation – Mining and Environment, Open cast mining, Oil exploration and transportation, Deforestation and their impact on environment. — 10 marks

Unit 3: Power generation and Environment – Various methods of power generation and their impact on environment — 10 marks

Unit 4: Natural Environmental Hazards – Earthquake, Volcano, Landslide, Flood and Cyclone - their impact on environment — 10 marks

Unit 5: Manmade Environmental Hazards – Hazards due to solid, liquid and gaseous pollutants from industries – effects on ecosystem and human being; Hazards due to Lead, Cadmium, Mercury and Arsenic — 10 marks

Unit 6: Global Environmental Issues : Green House effect – causes and associated hazards, Ozone layer depletion – causes and associated hazards, Deforestation and loss of bio-diversity, Human Population Growth — 10 marks

Unit 7: Problems of Urban Environment : Municipal waste, domestic waste, industrial waste; Road traffic and noise pollution problem, Air pollution problem — 10 marks

Unit 8: Problems of Rural Environment : Drinking water, Food and Fodder, Sanitation, Health and Hygiene — 10 marks

Unit 9: Environmental problems related to forest and wildlife – Forest and Wildlife management in Assam with special reference to Kaziranga National Park and Manas Tiger Reserve — 10 marks

Unit 10: Environmental problems related to grassland and wetlands – Overgrazing and land degradation, desertification, reclamation of degraded land; Human intervention on wetlands, siltation and eutrophication, reclamation of wetlands — 10 marks

ESG-5.2: Practical – 8 credits **100 marks**

1. Measurement of Noise
2. Determination of SPM in ambient air
3. Determination of Ca, Mg and Hardness of water.
4. Determination of Alkalinity of soil by titration method.
5. Determination of N, K, P of soil
6. Determination of association between two species in community by 2X2 contingency table and χ^2- test method
7. Determination of Sulphur in plant leaf
8. Determination of nitrogen in plant leaf
9. Measurement of parameters of an artificial pond or lake to find out its - (i) mean depth and (ii) index of lake performance
10. Plankton identification and quantification from water bodies

SEMESTER – VI

ESG-6.1: Environmental Monitoring and Management – 8 credits **100 marks**

Unit 1: Monitoring of Air Quality Parameters : Methods, Equipments, Units and Standards — 10 marks

Unit 2: Monitoring of Water and Soil Quality Parameters : Methods, Equipments, Units and — 10 marks

Standards

Unit 3: Methods for sampling and analysis of Environmental Data : Basic Statistics, Co-relation, Regression, Analysis of Variance and Hypothesis Testing (t-test, F-test and chi-square test) — 10 marks

Unit 4: Computer Applications: Introduction to computer – type, structure and configuration, Application of computer in Environmental Analysis. — 10 marks

Unit 5: Remote Sensing Application : Basics of remote sensing, Application of remote sensing in environmental monitoring – landforms, soil, vegetation, land use and wetland mapping — 10 marks

Unit 6: Environmental Impact Assessment (EIA) : Concept of EIA, Various methods of EIA and their relative advantages, EIA as a management tool — 10 marks

Unit 7: Environmental Management and Development : Concept of sustainable development, Global summits on Environment (Stockholm, Rio de Janeiro & Johannesburg) — 10 marks

Unit 8: Environmental Laws : Environmental Laws and Constitutional Provisions in India – Salient features of Indian Forest Act, Water Act, Air Act and Environmental Protection Act — 10 marks

Unit 9: Environmental Movements : Major environmental movements in India — 10 marks

Unit 10: Environmental Standards – Concept, Environmental protection standards; BIS, ISO, Environmental quality monitoring – ISO 14000 and its impact on developing countries — 10 marks

ESG-6.2: Practical – 8 credits **100 marks**

(A) Laboratory Works (Practical) — 50 marks

1. Determination of BOD and COD of water
2. Estimation of iron in water samples
3. Estimation of nitrate in water samples
4. Estimation of Phosphates in water samples
5. Determination of Nutrients content in wastewater
6. Estimation of soil moisture using moisture meter

(B) Project Work — 50 marks

The Project work is to be carried out by each student under the supervision of a faculty member. It should be related to environmental problems.

Recommended Books

1. Environmental Science (8th Edition) (2010): Daniel D. Chiras, Jones & Bartlett Ltd
2. Introduction to Environmental Science and Engineering (2nd Ed.) (2004): G. M. Masters, Pearson Education Pvt. Ltd.
3. Fundamentals of Environmental Science: G. S. Dhaliwal, G. S. Sangha and P. K. Raina, Kalyani Publication
4. General Climatology: Critichfield H. J.
5. Environmental Chemistry : A. K. De
6. Environmental Chemistry : B.K. Sharma, and H. Kaur
7. Fundamentals of Ecology : E. P. Odum
8. Aquatic Ecosystems : Kumar, A P H Pubh
9. Microbiology 6th ed: Purohit, Agrobios
10. Principles and Practices of Water Management: Panda; Agrobios
11. Renewable Energy – Environment and Development: M. Dayal; Konark Pub. Pvt. Ltd
12. Environmental Science (6th ed) (1997): Jr. G. T. Miller, Wadsworth Pub. Co.

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