Syllabus
Department of Environment Science

Four Year B.Sc Honours Course
Effective from the
Session : 2009–2010
National University
Subject: Environment Science
Syllabus for Four Year B. Sc Honours Course
Effective from the Session: 2009-2010

Year wise courses and marks distribution.

First Year Honours.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Marks</th>
<th>Credits</th>
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<tbody>
<tr>
<td>4452</td>
<td>Introduction to Environmental Science</td>
<td>100</td>
<td>4</td>
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<tr>
<td>4453</td>
<td>Fundamental of Chemistry</td>
<td>100</td>
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<tr>
<td>4454</td>
<td>Fundamental of Earth Sciences</td>
<td>100</td>
<td>4</td>
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<td>4455</td>
<td>Fundamental of Biological Sciences</td>
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<tr>
<td>4456</td>
<td>Mathematics for Environmental Sciences</td>
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<td>4457</td>
<td>Statistics for Environmental Sciences</td>
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<td>4458</td>
<td>Meteorology and Climatic Processes</td>
<td>100</td>
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<tr>
<td>4459</td>
<td>Laboratory and Field work on Environmental Sciences</td>
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<td><strong>Total</strong></td>
<td><strong>700</strong></td>
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Detailed Syllabus

**First Year**

Course Code: 4452, Course Title: Introduction to Environmental Science  Marks 100, 4 Credits

1. Definition, scope and goal of environmental sciences, it relation to other disciplines of science, environmental issues in Bangladesh and role of environmental science, state of environmental awareness, environmental communication and action oriented programs in Bangladesh and South Asia
3. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems, Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.
4. Biogeochemical Cycles of some important elements: Carbon, Nitrogen, Sulfur; their implication for global environmental changes.
5. Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystems (Forest ecosystems, Grassland ecosystems, Desert ecosystems, Aquatic ecosystems).
7. Environmental Pollution: Definition, causes, effects and control measures of Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards; Solid waste (Causes, effects and control measures of urban and industrial wastes), Role of an individual in prevention of pollution, Concept of Disaster (Floods, earthquakes, cyclones and landslides).


Recommended References:

Course Code: 4453, Course Title: Fundamental of Chemistry Marks 100, 4 Credits

1. The States of Aggregation of Matter: Gaseous, liquid and solid
   The Gaseous States: The gas laws, kinetic theory of gases, distribution of molecular velocities, molecular diffusion and effusion, deviations from ideal gas behavior, the van der Waals equation of state, abnormal vapor density, association and dissociation, degree of dissociation.
   The Liquid State: Liquefaction of gases, the critical state, determination of critical constants, the principle of corresponding state, attainment of low temperature, vapor pressure of liquid, surface tension
   The Solid State: Properties of solids, crystalline and amorphous solids, the crystal system.

2. Solutions and Colloids: Types of solutions, concentration units, Henry’s law, Nernst distribution law, solvent extraction, solution of non-electrolytes, vapor pressure lowering, boiling point elevation, freezing point depression, osmotic pressure, determination of molecular weight of solute from measurement of these properties, colligative properties of electrolytes, Colloids: Colloidal dispersions, some properties of colloids, colloidal pollutants.

3. The First Law of Thermodynamics: Formulation of the law, the nature of internal energy, reversible and irreversible processes, Joule-Thomson experiment.

4. The Structure of Atoms: Rutherford’s nuclear theory, isotopes and mass spectrograph, Plank’s quantum theory and photoelectric effect, Bohr’s model of the atoms and atomic spectra, Bohr-Sommerfield modification, Hund’s rule, Pauli exclusion principle, Aufbau principle, electronic configuration of atoms, uncertainty principle, electron probability distribution, wave-particle duality, shapes of orbital.

5. The Periodic Law and Modern Periodic Table: Some periodic properties of the elements: metallic behavior, atomic size, ionization energy, electron affinity and electronegativity, classification of elements.

6. Concepts of Chemical Bonds and Shapes of Molecules: Causes of reactivity of the elements and the octet rule, ionic, covalent and coordination bonds, preliminary treatment of the valence bond theory and the molecular orbital theory, hydrogen bond, metallic bond, van der Waals forces, the valence shell electron pair repulsion (VSEPR) theory for shapes of simple molecules.

7. General Concept of Oxidation-Reduction and Acid-Bases: Oxidation number and oxidation-reduction processes, balancing oxidation-reduction reactions, different concepts of acids and bases, relative strengths of acids and bases.

8. Organic Chemistry: General classification of organic compounds, structure, conformation, nomenclature, preparation, physical and chemical properties of different hydrocarbons (alkanes, olefenes, acetylenes, dienes and polymer), A General Concept on Preparation, Physical and Chemical Properties, Reaction Type and Structure of alcohols, aldehydes, ketones, carboxylic acid and amines.

Recommended References:
2. Elements of Physical Chemistry, S. Glasstone and D. Kews (McMillan & Co. Ltd).

Course Code: 4454, Course Title: Fundamental of Earth Sciences Marks 100, 4 Credits

1. Introduction to Earth Sciences: Definitions of Earth Sciences (Geological Sciences) and Environmental Science. The scope and subdivisions of Geological Sciences. Relationship between Earth Sciences and Environmental Science.
2. The Universe, Solar System and the Planet Earth: Big-Bang theory, solar system, different planets, origin of the solar system, interior of the earth layers of different compositions, layers of different physical properties, geothermal gradient.
4. Igneous and Volcanic Rocks: Igneous and volcanic activities, magma and its origin, solidification of magma, characteristics of lava, different types of plutons, volcanic landforms, classifications of igneous rocks.
7. Fossils, Evolution, and Extinction: Definition of fossil, types of preservation, conditions that favor preservation of fossils, types of evolution, reasons of extinction.
8. Geologic Time: Absolute vs relative time, radiometric age dating, and relative dating techniques, unconformities, correlation and geologic time scale.
10. Plate Tectonics: Continental drift, plate tectonics, continental collision, cause of plate tectonics, relation amongst plate tectonics, continental crust and mountain building.
11. Resources of Minerals and Energy: Mineral resources, origin of mineral deposits, useful mineral substances, energy resources, fossil fuels and other sources of energy.

Recommended References:
Course Code: 4455, Course Title: Fundamental of Biological Sciences  Marks 100, 4 Credits

1. Introduction: The structure and function of a living organism in this natural environment; components and ecological inter-relationships; Origin and evolution of life; Evolution in the plant and animal kingdom.
2. Brief account about Interactions between Environment and Organisms: Ecological concepts- Environment, Limiting Factors, Habitat and Niche; Kinds of Organism Interactions; Community and Ecosystem.
3. Classification: Groups of plants and their modern classification systems; Principles and kinds of classification; detailed study of Artificial (Linnaeus), Natural (Bentham and Hooker) and Phylogenetic (Engler and Prantle) classification; Outline of Whittaker’s system of classification. Monera-Protista; Eukaryotic and Prokaryotic Concept.
4. Taxonomy and systematic: Principles of nomenclature; author citation, principle of priority and conserved name, Herbarium: Definition, field and herbarium techniques; major herbaria of the world; Bangladesh National herbarium, preservation of funa
5. A brief introduction to major groups of bacteria and virus: Archaeabacteria and Eubacteria; Gram negative and Gram positive bacteria; Growth of bacteria; Mycoplasma; Bacteriaophage and its multiplication; Economic and Ecological Importance of bacteria and virus.
6. Fungi: General characters and classification of fungi; Salient features and life cycle of the following genera: Synchytrium, Phytophthora, Aspergillus, Penicillium, Helminthosporium, Saccharomyces; Economic and Ecological importance of fungi.
7. Algae: General characters and classification (upto class) of Algae: The general characters and economic importance of the classes: (a) Cyanophyceae, (b) Chlorophyceae, (c) Bacillariopyceae, (d) Xanthophyceae, (e) Chrysophyceae, (f) Euglenophyceae, (g) Phaeophyceae, (h) Rhodophyceae; Economic and Ecological importance of algae.
8. General characters, classification and biological significance of zooplankton and phytoplankton.
9. General characteristics and classification of animal phyla; species concept and taxonomic categories.

Recommended References:
Course Code: 4456, Course Title: Mathematics for Environmental Sciences  Marks 50, 2 Credits

1. Functions and their graphs for real numbers; limit and continuity; derivatives of elementary functions; chain rule; higher derivatives; partial derivatives; total differential; application to geometry-tangent, normals, maxima and minima, asymptotes.
2. Indefinite integral as inverse of derivatives; techniques of integration; definite integral as limit of a sum, interpretation as areas; determination of length and area of plane curve, beta and gamma functions.
3. Ordinary differential equations; general principles; elementary standard types; linear equation with constant co-efficients.
4. Vector space; differentiation of vectors; gradient, divergence, curl and their physical differences; linear dependence; base and dimension.
5. Summation of finite series (both algebraic and trigonometric).

Recommended References:

Course Code: 4457, Course Title: Statistics for Environmental Sciences  Marks 50, 2 Credits

1. Representation of data: pie chart, bar chart, histogram, and frequency distribution.
3. Measures of dispersion: variance, standard deviation, co-efficient of variation, mean deviation, range, quartile deviation, moments.
4. Relationship between variables: correlation analysis, regression analysis.

Recommended References:

Course Code: 4458, Course Title: Meteorology and Climatic Processes  Marks 100, 4 Credits

2. Heating Earth's Surface and Atmosphere: Solar Insolation of the earth and heat budget,
3. Water balance of the atmosphere: Humidity, Physical changes of state of water Processes of cooling to produce condensation and sublimation, Clouds formation and classification, Fog formation and type, Precipitation, causes, forms and types.

4. Air Pressure and Winds: Pressure, vertical distribution of pressure, Pressure gradient and wind, Factors affecting wind speed and direction; General atmospheric circulation, Seasonal changes in the general circulation, Oceanic circulation, Monsoon, local winds, mountain and valley breeze; Stability and instability, air masses sources region and classification, Extra tropical cyclone, anti cyclone, Thunderstorms.

5. Climate controls and Climate: Definition, production of climates, Climatic classification of the world and Worlds climatic regions, the role of oceans, El Nino-Southern Oscillation (ENSO) events, La Nina events, preliminary concepts of climate change.

**Recommended References:**

5. IPCC report (recent edition)

**Course Code:** 4459, **Course Title:** Laboratory and Field work on Environmental Sciences

**Marks 100, 4 Credits**

**Chemistry**

1. Introduction: Laboratory protocol, code of conduct, laboratory wears, safety rules, laboratory waste disposals, laboratory log book, acquaintance with common laboratory glassware and apparatus, characteristics of corrosive, hazardous and flammable liquids, primary and secondary standard substances, minimisation of parallax, operational and personal errors, representative data, laboratory data interpretation, dimensional analysis (factor-label method), calculation of equivalent weights of oxidizing agents, mass percentage, theoretical and percentage yield, calculation of strengths of standard solution, percentage of error calculation.

2. Preparation of Solutions: Preparation of normal and molar solution of common acid and bases, preparation of normal solution of oxidizing and reducing reagents (e.g, potassium dichromate, sodium thiosulfate, ferrous ammonium sulfate), preparation of dilute solutions, series dilution and strengths calculation of primary standard substances.

3. Acid-Base Reaction: Standardisation of base against standardise acid, standardisation of acid against standardise base.

4. Oxidation-Reduction Reaction: Determination of ferrous iron, ferric iron and total iron by oxidation with standard potassium dichromate solution.

5. Determination of cation and radicals by systematic qualitative analysis (group test).

6. Determination of anionic species by systematic qualitative analysis (group test).

**Earth Sciences**

1. Identification of Rocks and minerals on hand specimen
2. Environmental Surveying, Topo-sheet and map reading.
4. Field visit

**Biological Science**

1. Field survey on Biology for Environmental Sciences (protected areas, e.g., Eco-park).
2. Introduction to laboratory; Microscopic Technique; Preservatives, Stains and Mounting Media.
3. Study of algae, fungi and lichen.
5. Demarcation of phytoplankton and zooplankton.
8. Identification and characterization of Chondrichthys and Osteichthys.