Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/1st Semester
Subject Name: Essential Professional Communication,
Subject Code: LN-104

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Unit-I **04**

Introduction to Communication: Definition, Types of Communication, Channels of Communication, Language.

Unit-II **06**

Interpersonal Communication: Culture- Definition and Types, Communication and Culture including Cross Cultural Communication.

Unit-III **08**

Written Communication: Letter Writing- Informal and Formal - Letters of Enquiry, Letters of complaint, Response to complaints and enquiries, Self Exploration through description.

Unit-IV **12**

Grammar through Worksheets: Situational activities and modules- Parts of Speech, Tenses, Articles, Modals, Active and Passive, Subject-Verb Agreement, Direct and Indirect Speech, Degrees of comparison.

Unit-V **10**

Grammar through Worksheets Continued: Sentences: Simple, Compound, Complex, Declarative, Assertive, Negative, Interrogative, Exclamatory, Imperative

Books Recommended:

- Wren PC and Martin H, "High School Grammar and Composition", S. Chand and Co.
- K. Floyd , "Interpersonal Communication: The Whole Story" (2009), McGraw Hill,
- Greenbaum Sidney and Nelson Gerald, "An Introduction To English Grammar", Pearson Swan Michael, "Practical English Usage" OUP, 2005
- Raymond Murphy, " Intermediate English Grammar", (2007) Cambridge University Press

Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/1st Semester
Subject Name: Elementary Mathematics,
Subject Code: MT-108

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Unit-I **08**

Calculus: Limits and functions, definition of differential coefficient, differentiation of functions including function of a function, differentiation of parametric form, simple and successive differentiation.

Unit-II **08**

Integration: Integration as inverse of differentiation, Indefinite integrals of standard form, Integration by parts, substitution method and partial fraction method, Evaluation of definite integrals.

Unit-III **08**

Statistics: Basic concepts of Simple random sampling and stratified random sampling, measures of central tendency (mean, median and mode), measures of variation (mean deviation and standard deviation), Covariance, Karl Pearson's Coefficient of Correlation, Regression, method of least squares.

Unit-IV **08**

Permutation, Combination and Binomial Theorem: Fundamental principle of counting, Permutations, permutations under certain conditions, Combinations, combinatorial identities, Binomial theorem (without proof), some applications of Binomial theorem.

Unit-V **08**

Probability: Random experiment and associated sample space, events, definition of probability, algebra of events, addition and multiplication theorems on probability (without proof), Binomial, Poisson and Normal distributions analysis.

Books recommended:

- Murray R. Spiegel, 1980, Probability and Statistics, Schaum's (Outline Series) McGrawHill Book Co.
- Q.S Ahmad, V. Ismail and S.A Khan: Biostatistics, laxmi Publications Pvt.Ltd.
- E. Kreyszig, "Advanced Engineering Mathematics", 5th Edition, Wiley Eastern, 1985
- Mathematics, NCERT

Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/ 1st Semester
Subject Name: Earth and Earth Surface Processes, Subject Code: ES-116
(w.e.f. July 2017)

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Unit I: History of Earth **08**

Solar system formation and planetary differentiation; formation of the Earth: formation and composition of core, mantle, crust, atmosphere and hydrosphere; chemical composition of Earth; geological time scale and major changes on the Earth's surface; Holocene and the emergence of Humans.

Unit II: Earth system processes **08**

Movement of lithosphere plates; mantle convection and plate tectonics, major plates and hot spots, plate boundaries; sea floor spread; earthquakes; volcanic activities; gravitational and magnetic fields of the earth; origin of the main geomagnetic field; continental drift.

Unit III: Minerals and rocks **08**

Minerals and important rock forming minerals; rock cycle: Lithification and metamorphism; rock structure, igneous, sedimentary and metamorphic rocks; weathering: physical, biogeochemical processes; erosion: physical processes of erosion, factors affecting erosion; agents of erosion: rivers and streams.

Unit IV: Earth surface processes **08**

Atmosphere: evolution of earth's atmosphere, composition of atmosphere, physical and optical Properties, circulation; interfaces: atmosphere–ocean interface, atmosphere–land interface, ocean–land interface; land surface processes.

Unit V: Importance of being a mountain **08**

Formation of Peninsular Indian mountain systems-Western and Eastern Ghats, Vindhyas, Aravallis, etc. Formation of the Himalaya; development of glaciers, perennial river systems and evolution of monsoon in Indian subcontinent; formation of Indo-Gangetic Plains.

Books Recommended:

- Bridge, J., & Demicco, R. 2008. Earth Surface Processes, Landforms and Sediment deposits. Cambridge University Press.
- Gupta, A. K., Anderson, D. M., & Overpeck, J. T. 2003. Abrupt changes in the Asian southwest monsoon during the Holocene and their links to the North Atlantic Ocean. Nature **421:** 354-357.
- Keller, E.A. 2011. Introduction to Environmental Geology (5th edition). Pearson Prentice Hall.
- Pelletier, J. D. 2008. Quantitative Modeling of Earth Surface Processes (Vol. 304). Cambridge: Cambridge University Press. Chicago.

Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/1st Semester
Subject Name: Basics of Environmental Biology, Subject Code: ES-117
(w.e.f. July 2017)

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Unit-I. Taxonomy 08 Definition of taxonomy, systematics and classification; morphological and taxonomical studies of flora and fauna.

Unit -II. Concepts of Ecology 08

Subdivisions and developmental phases of ecology, ecological classification (hydrophytes, xerophytes, halophytes, mesophytes, lithophytes, chasmophytes, epiphytes) and their morphological, physiological and biochemical adaptation, ecological factors - climatic, edaphic, physiographic and biotic.

Unit -III. Evolutionary Biology 08

Evolution- Definition, scope and history, Darwinian view of life; Population-The basic unit of evolution, Origin of species, Phylogeny and systematics: Population ecology -Dynamics of population, Population growth-Exponential model Logistic growth model: Community ecology-Interactions- Biogeography, Speciation, Ecological succession.

Unit -IV. Biotic Community 08

Basic ideas on population in relation to ecology; Definition, eco-tone and edge effect, habitat and ecological niche, ecotypes, ecophene , ecological indicators; elementary idea on biogeochemical cycles (N, C, S, P).

Unit -V. Microbiology 08
Basic concept on structures and functions of bacteria and viruses.

Books Recommended:

- Muller-Dombols, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology, Wiley, New York.
- Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia.
- Robert Ricklefs (2001). The Ecology of Nature. Fifth Edition. W.H. Freeman and Company.
- Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology and Management. Wiley Eastern Limited, Lucknow, India.
- Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut.
- Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York.
- Botkin, D.B. and Keller, E.A. 2000. Environment Science: Earth as a living planet. Third Edition. John Wiley and Sons Inc.

Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/1 st Semester
Subject Name: Introduction to Environmental Chemistry,
Subject Code: ES-118 (w.e.f. July 2017)

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Unit -I. Unit 1: General Principles of Environmental Chemistry 08

Concept & Scope of Environmental chemistry, Pollutant, Contaminant, Receptor, Sink, pathways of Pollutant, Speciation, Dissolved Oxygen, Chemical Oxygen Demand, Biological Oxygen Demand, Threshold Limit Value, Elementary Idea on carbohydrates, Proteins & lipids, Chemical accidents like Bhopal gas tragedy (India), Love Canal tragedy (USA) etc.

Unit 2:-Atmospheric Chemistry 08

Composition of Atmosphere, Earth's radiation balance, Particles, Ions and Radicals in the atmosphere, Chemical Processes for Formation of Inorganic Particulate Matter, Chemical Processes for formation of Organic Particulate matter, Chemical & Photochemical Reactions in the atmosphere, Ozone Chemistry, Instrumental Techniques for Air pollution control .

Unit 3:-Aquatic Chemistry 08

Hydrological Cycle, Water Quality Parameters, Physical chemistry of Sea water, micro-organisms–The catalysts of aquatic chemical Reactions, Role of Chemicals in treatment of water, Principles of sedimentation & coagulation.

Unit 4:-Soil Chemistry 08

Composition of Lithosphere/soil, water and air in soil, Inorganic and organic components in soil, Acid – Base and Ion exchange reactions in soil, Micro and Macro nutrients, Nitrogen Pathways and NPK in Soil.

Unit 5: Environmental Chemistry 08

Toxic chemicals in the environment, Impact of Toxic chemicals on Enzymes, Biochemical effects of Arsenic, Biochemical effects of Cadmium, Biochemical effects of lead, Biochemical effects of Mercury, Biochemical effects of Carbon Monoxides, Biochemical effects of Pesticides, Fluoride Toxicity in water.

Recommended Books:

- Baird and Colin "Environmental Chemistry"
- Bailey, Clark , Ferris, Krause and Strong "Chemistry of Environment"
- Manahan, Stanley E. Fundamentals of Environmental Chemistry Boca Raton: CRC Press LLC,2001
- Anil Kumar De "Environmental Chemistry ", New Age International Publishers

Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/1st Semester
Subject Name: Soil and Water Chemistry, Subject Code: ES-119 (w.e.f. July 2017)

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List of Experiments

- Estimation of various water quality parameters like pH, Conductivity, DO, BOD, COD etc.
- Measurement of soil parameters like pH, EC etc.
- Identification of Rocks etc.
- Documentation and Preparation of Herbarium.

Integral University, Lucknow Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/2nd Semester
Subject Name: Basics of Computer Subject Code: CS-110

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Unit-I 08 Introduction to Computers: Define Computer, Characteristics features of Computer, Hardware and Software of Computer, languages of Computers, Applications, Block Diagram of Computer System, and Computer Generations.

Unit-II **08**

Basic Computer Organization: Essentials of computer operation, Input-Process- Output Basic Organization of Computer System in Detail- I/O Devices and its functions, Memory management, Booting process (BIOS), Memory Management-RAM, ROM etc. Storage devices - Hard disc, Floppy disc, CD-ROM.

Unit-III **08**

Operating Devices and Operating Environment: Features, Advantages and Drawbacks, DOS, WINDOWS & UNIX; Introduction to Data Processing and Flowchart, Operating environment, MS Office in Detail (Word, Excel & Power Point), short cut keys used in Word, Excel & Power Point.

Unit-IV

08

Computer Networking: Introduction to networking, Modem, Network topology concepts and types with advantages and drawbacks of each, components of LAN, WAN and MAN, Medium used in Networks.

Unit-V **08**

Internet and Web Technologies: History and concept, Architecture, Application, Hypertext Markup Language, DHTML, WWW, Gopher, FTP, Telnet, Web Browsers, Net Surfing, Search Engines, Email, Digital Signatures, Network, Security, Firewall.

Books Recommended:

- Curtin, "Information Technology: Breaking News", TMH.
- Raja Raman, V. "Introduction to Computers".
- Nelson, "Data Compression", BPB
- Bajpai, Kushwaha & Yadav, "Introduction To Computer & C Programming", New Age
- Lehngart, "Internet 101", Addision Wesley.
- Chanchal Mittal "Foundation of Information Technology" Pragati.
- Computer Fundamentals- by Sinha. PK and Sinha P. BPB (Publisher)

Integral University, Lucknow Department of Environmental Science B.Sc. (Hons.) Environmental Science, 1st Year/2nd Semester
Subject Name: Environmental Pollution Subject Code: CH-107

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Unit-I 08 Air pollutants: CO, CO2, ozone, CFC; ozone depletion; global warming & NOx; Harmful effects of pollutants on living and non-living species; Oxygen, nitrogen and CO2 cycle, Air quality standard, Bhopal gas tragedy, Chernobyl disaster.

Unit-II **08**

Water quality parameters; international and national standards; Water quality assessment. Water pollution and its control; water pollutants; toxicity. Water sampling techniques, Preservation.

Unit-III **08**

Agricultural pollutants: Fertilizers, insecticides, pesticides, plastics, toxic metals, dyes, surfactants and their toxicity; international and national standards; control.

Unit-IV **08**

Industrial waste: toxic aspects, management and disposal. Radioactive, municipal, and biomedical waste – toxicity hazards, management and disposal.

Unit-V **08**

Chemical Toxicology: Toxic chemicals in the Environment, biochemical effects of Mercury and Lead, Carcinogens, Vector-borne disease, water-borne disease, Pollution and Public Health issues.

Books recommended:

- Environmental Chemistry Manahan, Stanley E, 2004, Taylor & Francis Ltd
- Basic Concepts of Environmental Chemistry, Desley W. Connell, 1 edition, CRC-Press
- Environmental Chemistry: A Global Perspective, Gary W. Vanloon Stephen J. Duffy, Oxford Univ Pr (Sd)
- Introduction To Environmental Chemistry, Reid, Brian J. Blackwell Science Ltd
- Chemistry of the Environment, Thomas G. Spiro, William M. Stigliani, 2nd Edition, Prentice Hall publication.
- Environmental Chemistry, Vanloon, Gary W Duffy, Stephen J., Oxford Higher Education publication
- Environmental Chemistry, Colin Baird, Michael Cann, 3rd edition, W. H. Freeman

Integral University, Lucknow Department of Environmental Science B.Sc. (Hons.) Environmental Science, 1st Year/2nd Semester
Subject Name: Elements of Ecology, Subject Code: ES-120
(w.e.f. July 2017)

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Unit-I Ecological Principles **08**

Definition, Scope and basic principles of ecology and environment. Biological levels of organization, population, community, ecosystem and biosphere. Climatic factors-Solar radiations, temperature, water and precipitation.

Unit-II Habitat and Niche **08**

Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. Soil formation, soil types, soil profiles. Physical and chemical characters of soil, Soil biological characters. Topographic factors.

Unit-III Population Ecology **08**

Basic concepts, population characteristics – density, natality, mortality, age-structure, population growth. Positive and negative interactions of populations – competition, predation, parasitism, mutualism.

Unit-IV Community Ecology **08**

Community: Basic concepts, community structure, growth forms, life form. Analytical and synthetic characters of plant community. Methods of plant community analysis. Concept of keystone species and ecotone.

Unit-V Biogeography: **08**

Major terrestrial biomes; theory of island biogeography; biogeographical zones of

India. **Suggested Readings**

- Muller-Dombols, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology, Wiley, New York.
- Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia.
- Robert Ricklefs (2001). The Ecology of Nature. Fifth Edition. W.H. Freeman and Company.
- Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology and Management. Wiley Eastern Limited, Lucknow, India.
- Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut.
- Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York.
- Botkin, D.B. and Keller, E.A. 2000. Environment Science: Earth as a living planet. Third Edition. John Wiley and Sons Inc.

Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/2nd Semester
Subject Name: Ecosystem Dynamics, Subject Code: ES-121
(w.e.f. July 2017)

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Unit-I Concept of Ecosystem **08**

Ecosystem: Basic concepts, components of ecosystem. Trophic levels, food chains and food webs. Ecological pyramids, ecosystem functions.

Unit-II Biogeochemical Cycles **08**

Introduction to bio-geochemical cycles and its importance, gaseous and sedimentary Cycles, Carbon, Nitrogen, Phosphorus and Sulphur Cycles, Oxygen Cycles, Hydrological cycles.

Unit-III Biomes **08**

Major biomes of the world, Characteristics of terrestrial ecosystems like forests, grasslands, desert, mountain, Aquatic ecosystems like fresh water, estuary, marine ecosystems.

Unit-IV Ecosystem Energetic **08**

Primary and gross productivity, decomposition, Environmental factors affecting plant productivity, Law of thermodynamics, Flow of Energy, Energy flow Models, Energy efficiencies.

Unit-V Disturbance, adaptation and development **08**

Ecological disturbances like fire, insect outbreak etc., Introduction to ecological succession, Concepts of succession, Classification and Trends in Succession, Co-evolution and group selection.

Recommended Books:

- Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia.
- Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut.
- Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York.
- Botkin, D.B. and Keller, E.A. 2000. Environment Science: Earth as a living planet. Third Edition. John Wiley and Sons Inc.

Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/ 2nd Semester
Subject Name: Atmosphere and Global Climate Change, Subject Code: ES-122
(w.e.f. July 2017)

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Unit I: Atmospheric circulation 08 Movement of air masses; atmosphere and climate; air and sea interaction; southern oscillation; western disturbances; El Nino and La Nina; tropical cyclone; Indian monsoon and its development, changing monsoon in Holocene in the Indian subcontinent, its impact on agriculture and Indus valley civilization; effect of urbanization on micro climate; Asian brown clouds.

Unit II: Meteorology and atmospheric stability 08
Meteorological parameters (temperature, relative humidity, wind speed and direction, precipitation); atmospheric stability and mixing heights; temperature inversion; plume behavior; Gaussian plume model.

Unit III: Global warming and climate change 08
Earth's climate through ages; trends of global warming and climate change; drivers of global warming and the potential of different green house gases (GHGs) causing the climate change; atmospheric windows; impact of climate change on atmosphere, weather patterns, sea level rise, agricultural productivity and biological responses - range shift of species, CO2 fertilization and agriculture; impact on economy and spread of human diseases.

Unit IV: Ozone layer depletion 08
Ozone layer or ozone shield; importance of ozone layer; ozone layer depletion and causes; Chapman cycle; process of spring time ozone depletion over Antarctica; ozone depleting substances (ODS); effects of ozone depletion; mitigation measures and international protocols.

Unit V: Climate change and policy 08
Environmental policy debate; International agreements; Montreal protocol 1987; Kyoto protocol 1997; Convention on Climate Change; carbon credit and carbon trading; clean development mechanism.

Suggested Readings:

- Barry, R. G. 2003. Atmosphere, Weather and Climate. Routledge Press, UK.
- Hardy, J.T. 2003. Climate Change: Causes, Effects and Solutions. John Wiley & Sons.
- Harvey, D. 2000. Climate and Global Climate Change. Prentice Hall.
- Maslin, M. 2014. Climate Change: A Very Short Introduction. Oxford Publications.
- Mathez, E.A. 2009. Climate Change: The Science of Global Warming and our Energy Future. Columbia University Press.
- Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S. & Sen, K. 2004. Climate Change and India. Universities Press, India.
- Philander, S.G. 2012. Encyclopedia of Global Warming and Climate Change (2nd edition). Sage Publications.

Integral University, Lucknow
Department of Environmental Science
B.Sc. (Hons.) Environmental Science, 1st Year/ 1st Semester Subject
Name: Ecosystem Lab, Subject Code: ES-123
(w.e.f. July 2017)

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1. Field vegetation analysis using quadrates, Line transects etc.
2. Model Making of some economically important insects like Honey Bee
3. Mapping of Climatic classification of India on the basis of rainfall and temperature.
4. Visit to a Wild Life Sanctuary/National Park/Zoo for ecosystem study.
5. Visit of local industrial effluents for effluent collection.

Suggested Readings

- Allen, S.E., H.M. Grimshaw, J. Parkinsen, and C. Quarmby. 1974, Chemical Analysis of Ecological materials, Black will scientific publications, Oxford, IBH.
- Anderson, J.M. and J.S.I, Ingram 1993, Tropical soil biogas and fertility: A handbook of method, CAB International, Wailing ford, U.K.
- Misra, R. 1968. Ecology workbook Oxford and IBH Publishing Co., New Delhi.
- Michael, P. 1984. Ecological Methods for field and laboratory investigations. Tata – MxcGraw Hill Publishing Company Ltd., New Delhi.