

Suggestive readings

- Bridge, J., & Demicco, R. 2008. Earth Surface Processes, Landforms and Sediment Deposits. Cambridge University Press.
- Cronin, V.S., 2018. Laboratory Manual in Physical Geology. Pearson.
- Keller, E.A. 2011. Introduction to Environmental Geology (5th edition). Pearson Prentice Hall.
- Leeder, M., Arlucea, M.P. 2005. Physical Processes in Earth and Environmental Sciences. Blackwell Publishing.
- Ludman, A. and Marshak, S., 2010. Laboratory manual for introductory geology (p. 480). WW Norton & Company.
- McCann, T., 2021. Pocket Guide Geology in the Field. Springer, Bonn, Germany.
- Pelletier, J. D. 2008. Quantitative Modeling of Earth Surface Processes (Vol. 304). Cambridge: Cambridge University Press. Chicago.
- Rutford, R.H., and Carter, J.L., 2018. Zumberge's Laboratory Manual for Physical Geology, Sixteenth Edition, Mc-Graw-Hill Education, New York, USA.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC CORE COURSE – 2: ENVIRONMENTAL PHYSICS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
ENVIRONMENTAL PHYSICS	4	2	0	2	Class X II pass	NIL

Learning Objectives

- Build conceptual understanding of the environment by understanding the underlying principles of physics governing environmental processes
- Develop perspective on the concepts of physics associated with the movement of particles, chemicals, and gaseous across the environmental compartments
- Gain insights into physics of plant-soil-water interface determining ecosystem processes

Learning outcomes

After this course, students will be able to

- Apply principles of physics to manage soil, water, and plant growth, especially in extreme environment

- Acquire skills to predict and manage pollutant movement across the environmental phases using concepts of physics
- Assess the impact of change in soils properties and field data at the microscale on tracking environmental contaminants
- Analyse soil particle size fractions and determine their impact on the movement of water and other solutes
- Correlate environmental processes in the ocean and terrestrial ecosystems on weather and climate
- Use satellite data to interpret radiation data and its impact on living organisms and ecosystems

SYLLABUS OF DSC-2

UNIT – I Environmental spectroscopy (6 hours)

Basic concepts of light and matter; quantum mechanics (relation between energy, wavelength and frequency), black body radiation, Kirchhoff's law, Boltzmann equation, Introduction to the concept of absorption and transmission of light, Beer–Lambert law, photovoltaic and solar cells.

UNIT – II Ocean and Atmosphere (6 hours)

Oceanic waves and circulation, Atmospheric temperature, pressure, circulation, precipitation and other features, Lapse rate (dry and moist adiabatic), Scattering of light, Rayleigh and Mie scattering, Electromagnetic radiations and spectrum, Greenhouse effect.

UNIT – III Soil and Water Physics (6 hours)

Phase transition of water and its consequences for marine and freshwater life, and rock structures, Clausius–Clapeyron equation of thermodynamics and liquid–vapor phase transition, Soil temperature and heat flow, Aggregation of soil particle size fractions, Stress, strain and strength of soil bodies, Diffusion and dispersion in soils and water. Redistribution, retention and evaporation of soil moisture and gaseous components

UNIT – IV Movement of pollutants in environment (6 hours)

Diffusion and dispersion, point and area source pollutants, pollutant dispersal; Gaussian plume model, mixing heights, hydraulic potential, Darcy's equation, types of flow, turbulence

UNIT – V: Eco-physics (6 hours)

Soil–Plant–Water Relations, Water entry into soil, Water and energy balance, Plant up take and water use efficiency; Open or closed ecosystems, Macroscopic flows of matter or energy, Disturbance or catastrophe and phase space changes in ecosystems, Thermodynamic entropy, Ecosystem efficiency, Simulated landscapes.

Practical component (if any) – (60 hours)

1. Analyze the variations in hydraulic conductivity of different soil types
2. Determine the soil temperature and thermal conductivity in different soil particle size fractions
3. Find association between heat transfer ability and the soil types
4. Estimate radon released by different materials with time
5. Monitor the health of green plants and variations in photosynthesis with varying fluorescence

- Interpret the Gaussian plume model for the movement of pollutants in the environment.
- Analyze the principle and applications of black body radiation and Beer–Lambert law.
- Simulate the meteorogram of any geographical region and interpret it.

Suggestive readings

- Boeker, E. & Grondelle, R. 2011. Environmental Physics: Sustainable Energy and Climate Change. Wiley.
- Borghese, F., Denti, P. and Saija, R., 2007. Scattering from Model Nonspherical Particles: Theory and Applications to Environmental Physics. Springer Science & Business Media.
- Forinash, K. 2010. Foundation of Environmental Physics. Island Press.
- Monteith, J. and Unsworth, M., 2013. Principles of Environmental Physics: Plants, Animals, and the Atmosphere. Academic Press.
- Smith, C., 2004. Environmental Physics. Routledge.

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DISCIPLINE SPECIFIC CORE COURSE – 3: ENVIRONMENTAL CHEMISTRY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
ENVIRONMENTAL CHEMISTRY	4	2	0	2	Class X II pass	NIL

Learning Objectives

- Design strategies based on principles of environmental chemistry to The Learning Objectives of this course are as follows:
- Develop concepts of environmental chemistry as a fundamental principle of various environmental processes
- Link pollutant chemistry as a basis of pollution potential of contaminants
- Gain insights into chemical reactions that govern the movement of chemical contaminants across the environmental compartments and develop solutions that influence pollutant chemistry.

Learning outcomes

The Learning Outcomes of this course are as follows: