

DISCIPLINE SPECIFIC ELECTIVE (DSE-EVS-18): INTRODUCTION TO OCEANOGRAPHY

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
		Lecture	Tutorial	Practical/ Practice		
DSE-EVS-18: INTRODUCTION TO OCEANOGRAPHY	4	2	0	2	Class XII pass	NA

Learning objectives

The Learning Objectives of this course are as follows:

- Familiarize with physico-chemical, and geological characteristics of the ocean
- Gain insights into the interactions among the ocean-atmosphere-land in the background of human activities
- Emphasize the importance of the ocean for human well-being and sustainability

Learning outcomes:

After the course, students will be able to

- Assess the critical linkages among physico-chemical and geological processes occurring in the oceans
- Decipher the interactions between the ocean and Earth's components
- Analyze oceanographic data analysis and interpret it to relate it with human activities and global environmental policies
- Develop an appreciation of the relevance of oceans in society and determining global challenges

SYLLABUS OF DSE-EVS-18

Theory (02 Credits: 30 lectures)

UNIT – I Oceanography basics (2½ Weeks) (5 lectures)

Definition of oceanography, History of oceanography, Importance of oceanography, Scientific methods in oceanography, Oceanographic tools and equipment, Ocean basins and features, Ocean circulation, Oceanography career opportunities

UNIT – II Physical and chemical oceanography (3 Weeks) (6 lectures)

Properties of seawater, Ocean currents, Waves, Tides, Ocean circulation, Heat budget, Water masses, Coastal oceanography

Properties of seawater, Major ions in seawater, Nutrients, Dissolved gases, pH and ocean acidification, Biogeochemical cycles, Marine pollution, Harmful algal blooms

UNIT – III Geological and biological oceanography (3 Weeks) (6 lectures)

Plate tectonics, Seafloor, Marine sediments, Paleooceanography, Mineral resources, Coastal processes, Sea level rise due to climate change, Oceanographic data and its analysis

Marine life and ecosystems: phytoplankton, zooplankton, mammals, and fisheries; Climate change and marine ecosystems

UNIT –IV Marine ecology (2 Weeks) (4 lectures)

Marine food webs and ecosystem dynamics, Mangroves and coral reefs, seagrass beds, Deep-sea ecosystems, Marine conservation and protected areas

UNIT –V Oceanography and climate (2½ Weeks) (5 lectures)

Ocean-atmosphere interactions, Oscillations: El Niño-Southern, North-Atlantic; Monsoons and climate modelling, Hurricanes and typhoons, Climate change policy and oceanography

UNIT –VI Oceanography and human interaction (2 Weeks) (4 lectures)

Maritime history and culture, Oceanographic related: law, policy, economics, technology, education, tourism, and recreation

Teaching and learning interface for theoretical concepts

To achieve the course objectives and match with the contents, a wide range of teaching and learning tools will be employed, including (a) Formal lectures; (b) Interactive sessions using visual aid; (c) Case study analyses; (d) Hypothetical scenario building; (e) Group discussion on key topics; and (f) documentary screening and critical analyses.

Practicals/Hands-on Exercises – based on theory (02 Credits: 60 hours)

1. Familiarize with common oceanographic equipment such as CTD, Niskin bottles, and plankton nets
2. Measure seawater temperature, salinity, and density using a CTD
3. Analyse satellite imagery for oceanographic data such as sea surface temperature and chlorophyll concentration
4. Calculate oceanographic parameters using remote sensing data
5. Measure seawater pH and carbonate chemistry using a spectrophotometer
6. Calculate pH and pCO₂ values from carbonate chemistry data
7. Interpret oceanographic data and preparation of graphical presentations
8. Analyse marine resources such as fisheries and aquaculture using data from government agencies and scientific literature
9. Analysis of marine spatial planning data such as marine protected areas and shipping lanes
10. Calculate spatial distribution of marine resources and assessment of the impact of human activities on marine ecosystems
11. Analyse marine policy and law at national and international levels
12. Calculate the impact of marine policy and law on marine ecosystems and human societies

Teaching and learning interface for practical skills

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including (a) laboratory practicals; (b) field-work exercises; (c) customized exercises based on available data; (d) survey analyses; and (e) developing case studies; (f) demonstration and critical analyses; and (h) experiential learning individually and collectively.

Essential/recommended readings

- Knauss, J. A. (2016). Introduction to Physical Oceanography (2nd ed.). Waveland Press.
- Sverdrup, K. A., Armbrust, E. V., & Armstrong, R. A. (2019). Introduction to the World's Oceans (11th ed.). McGraw-Hill.
- Talley, L. D., Pickard, G. L., Emery, W. J., & Swift, J. H. (2019). Descriptive Physical Oceanography: An Introduction (6th ed.). Academic Press.
- Thurman, H. V. (2017). Introductory Oceanography (11th ed.). Prentice Hall.
- Trujillo, A. P., & Thurman, H. V. (2021). Essentials of Oceanography (13th ed.). Pearson.

Suggested readings

- Garrison, T. (2020). Oceanography: An Invitation to Marine Science (10th ed.). Cengage Learning.
- Martin, J. H., & McCorkle, D. C. (2016). An Introduction to Oceanography (2nd ed.). Jones & Bartlett Learning.
- Pinet, P. R. (2018). Invitation to Oceanography (7th ed.). Jones & Bartlett Learning.
- Segar, D. A. (2019). Introduction to Oceanography: A Life-Earth Science Approach. Springer.
- Stewart, R. H., & Church, T. M. (2019). Oceanography and Marine Biology: An Introduction to Marine Science. Garland Science.

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