DISCIPLINE SPECIFIC CORE COURSE– DSC – 18: Paleoceanography and Paleoclimate (L3, P1)

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		
DSC – 18: Paleoceanography and Paleoclimate (L3, P1)	**4**	**3**	**0**	**1**	**12th pass with science**	**Studied Earth System Science, Structural Geology, and Mineralogy or Equivalent**

Learning Objectives
The course is intended to make students aware about the climate changes through geological time periods, the chaotic nature of the Climate System, its behaviour at various time scales, and its influence on biotic system. Students will also be introduced to futuristic approaches and projections of the Inter-Governmental Panel of Climate Change, and scientific issues related to climate change. As the Oceans cover 70 percent of the Earth's surface understanding the evolution of oceans through time is essential to understand their role in controlling the earth's climate at various time scales.

Learning Outcomes:
After completing the course, the student will be able to comprehend the role of Oceans in controlling the Earth's climate at various time scales. The students will be able to independently interpret the proxy record generated from various paleoclimate archives. Archives. The student will develop an overall understanding of the Ocean-Climate linkages, Tectonics -climate linkages and modern climate change.

SYLLABUS OF DSC-18
Theory (45 hours)

UNIT – I (9 hours)
Detailed contents
Weather, Climate, Components of climate, Climate classification. Insolation, short and long-term changes in Insolation.

UNIT – II (9 hours)
Detailed contents
Aerosols: Definition, origin, role in climate change. Greenhouse gases: Introduction, causes of changing concentration, role in climate change.

UNIT – III (9 hours)
Detailed contents
Origin and evolution of Oceans. Closing and opening of Ocean Gateways and the resultant effect on climate. Climate of the Arctic and Antarctica through the ages. Bipolar See Saw, Polar Amplifications. Ice core studies and climate change. Oceanic sediments, Terrigenous, biogenic sediments, and their distribution.

UNIT – IV (9 hours)
Detailed contents
Sea-level: factors affecting sea-level changes, Short and long-term sea-level variability, evidence of sea-level change from marine sediments. Ocean-climate linkage. Effect of topography/tectonics on climate. Natural variability in climate. Human influence on climate change.

UNIT – V (9 hours)
Detailed contents
Historical evidence of climate change. Effects of climate change on mankind. Sampling methods for retrieving archives of climate/oceanographic change. Various dating methods of the marine cores., merits and demerits of various dating methods Paleoclimatic/paleoceanographic reconstruction from archives. Elemental and isotopic analysis for paleoclimatic/paleoceanographic reconstruction, Instruments used for paleoclimatic/paleoceanographic studies. Modeling climate change, IPCC climate change projections.

Practical Component- (30 Hours)
Processing of marine core samples for paleoclimatic/ paleoceanographic studies. Exercises in oceanography. Interpretation of various types of paleoceanographic and paleoclimatic data.

Essential/recommended readings
Bradley, R.S., Paleoclimatology: Reconstructing Climates of the Quaternary, Academic. Press.
Brasier, M.D. 1980 Microfossils, George Allen and Unwin.

Suggestive readings
Frank J Millero, Chemical Oceanography, CRC Press, Taylor and Francis Group, 2013
Alan Trujillo (Author), Harold Thurman (Author), Essentials of Oceanography 13th Edition, 2023, Pearson Education.
Bradley, R.S., Paleoclimatology: Reconstructing Climates of the Quaternary, Academic. Press.
Brasier, M.D. 1980 Microfossils, George Allen and Unwin.
Cronin, T.M., 1999. Principles of Paleoclimatology, Columbia University Press.
Fischer, G. and Wefer, G 1999 Use of Proxies in Paleoceanography: Examples from the South Atlantic, Springer.
Haq and Boersma, 1978. Introduction to Marine Micropaleontology, Elsevier.
Kennett, J.P.1982 Marine Geology, Prentice-Hall Inc.
North, G.R. and Crowley, T.J., 1995. Palaeoclimatology, Oxford University Press
Schopf, TJ.M., 1980. Paleoceanography, Harvard University Press.
Tolmazin, D., 1985. Elements of Dynamic Oceanography, Allen and Unwin.