Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NGLD304	Geoarchaeology	3	0	0	3

Course Objective
The course explores the use of geological, chemical, and geographic information system (GIS) methods in human-environment interactions from the Early Pleistocene to the current Anthropocene crisis. The course provides a foundation for understanding the sustainability of the Earth and society.
Learning Outcomes
Upon completion of the course, students will be able to understand: • Explain how humans evolved and transformed landscapes through Earth system feedbacks. • Integrate concepts from geology, geomorphology, biomes, and climate to interpret past societies and their sustainability. • Analyse archaeological site formation processes using biogeochemical methods. • Apply geochemical methods to investigate human–environment interactions. • Evaluate the role of humans in the Great Acceleration and the Anthropocene crisis.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	The Quaternary timescale and its relation to human evolution and culture. Topics include understanding the phases of human evolution, the rise of Homo sapiens, the extinction of large mammals from Earth, the early dispersal of humans from Africa to Asia, and their migration within the Indian subcontinent. Other topics include the oldest and youngest stone tools and fire records from around the world and India.	8	Understanding Human Evolution and Dispersal Through the Lens of Geology and Archaeology.
2.	Dating Methods in the Quaternary, Dating Materials in the Quaternary, How We Date Archaeological Sites and Events, ^{14}C AMS Radiocarbon Dating, OSL/IRSL Dating, ESR Dating, Rock Exposure Dating Using OSL Methods, Argon-Isotope Dating and Its Applications, Uranium-Series Dating and Its Applications, Dendrochronological Dating and Its Applications.	8	Learn how to develop a chronological framework for geological and archaeological events during the Quaternary period.
3.	Geological and Biogeochemical Methods in Quaternary and Archaeology: Stratigraphic and microstratigraphic use to understand depositional environment, Organic compounds and their applications, an introduction to stable isotopes, and how to understand the provenance of pottery, stone tools, and sediments. Topics include the migrations of humans and animals, how to reconstruct climate, vegetation, fire, and dietary adaptations over time.	9	Understand how biogeochemical methods are used to study past environments and landscape changes.
4.	Study the settlement distribution and patterns of early humans, as well as the criteria for archaeological site formation and selection. Use case studies from geological formations, geomorphological features, biomes, and climate aspects of the regions to understand the cognitive abilities of early humans and how they evolved.	7	Learn how to integrate diverse disciplines and prepare for transdisciplinary thinking.
5.	Development of culture and society, domestication of plants and animals, rise of agriculture and its effect on human cognitive abilities, rise in CO_2 and CH_4 linked to agriculture and its feedback to Earth systems, wild versus domesticated varieties of rice, and early anthropogenic hypothesis (EAH), history, Sustainability in urbanisation, mining, and land use.	8	Understand the evolution, domestication, development, and sustainability of society and the planet.
6.	Application of AI and ML in geoarchaeology and sustainability	2	Where and how to use AI/ML in geoarchaeology and sustainability.
	Total Classes	42	

Textbooks:

1. Cordova, C., 2018. Geoarchaeology: the human-environmental approach. Bloomsbury Publishing.
2. Rapp, G.R., Hill, C.L. and Hill, M.C.L., 2006. *Geoarchaeology: the earth-science approach to archaeological interpretation*. Yale University Press.

Reference Books:

1. Goldberg, Paul, and Richard I. Macphail. 2006. Practical and Theoretical Geoarchaeology. Blackwell Science, Malden, Massachusetts
2. Walker, M., 2005. Quaternary dating methods. John Wiley & Sons.
3. Randhawa, M.S., 1980. *A History of Agriculture in India: Beginning to 12th century* (Vol. 1). Indian Council of agricultural research.
4. Ruddiman, W.F., 2017. Plows, plagues, and petroleum: how humans took control of climate. Princeton University Press.
5. Ruddiman, W.F., 2014. Earth transformed. New York: WH Freeman.