

Course Title: Earth and Earth Surface Processes				
Course code:	No. of credits: 4	L-T-P: 60-0-0	Learning hours: 60	
L: Lectures; T: Tutorials; P: Practicals				
Pre-requisite course code and title (if any): None				
Department: Natural and Applied Sciences				
Course coordinator:		Course instructor:		
Contact details:				
Course type: Core		Course offered in: Semester 1		
Course Description This course provides introductory knowledge of the earth and its surface processes. Due to their dynamic nature, these processes affect the environment. Therefore, any environmental change due to these earth surface process needs to be studied carefully before making any policy decisions or targeted interventions. The course content describes the origin of the Earth, its structure, and terrestrial processes, surrounding atmospheric phenomena and oceanic environment. Combined knowledge of all these processes provides the students with a basic understanding of the earth and its environment. It will also be helpful in developing basics for any environmental or earth system modeling studies later.				
Course Objectives The course aims to build the following basic concepts among the students: <ul style="list-style-type: none"> • Understanding of the Earth's structure, composition, and surface processes. • Understanding of the atmospheric environment and associated interactions • Understanding the oceanic environment and land-atmosphere-ocean interactions. 				
Course content				
	Topic	L	T	P
1	Module 1: Origin and Structure of Earth			
	Being an introductory module in earth sciences, this module familiarizes students with the following concepts regarding the origin, history and structure of the Earth: Origin of the solar system and formation of the Earth: internal structure of Earth; formation and composition of core, mantle and crust, concept of geological time scale	4		
2	Module 2: Geology and Geomorphology			
	This module is focused on developing fundamentals of internal structure, composition and surface-subsurface processes associated with the Earth's land masses. The contents of this module are as follows: Plate-tectonics: concept of plate tectonics, seafloor spreading and continental drift. Earthquake and earthquake belts; volcanoes- types, products, and distribution of volcanic belts.	6		
	Materials of the solid Earth. Types of rocks – igneous, sedimentary and metamorphic; Rock cycle. Rock and ore forming minerals, weathering and soils, soil formation and their types	6		
	Terrestrial forces: endogenic and exogenic, continental drift, mountain building, earthquake, fold, and fracture; Plate-tectonic theory, seafloor spreading.	6		
	Slope development theory (Penk and Davis), biological, chemical and physical process of erosion, deposition and transportation, agents of erosion and their cycle	6		

3	Module 3: Atmosphere		
	This module introduces students to the composition and various phenomena associated with the Earth's atmosphere. Its focus is primarily to impart a basic understanding of how the Earth's atmosphere impacts the land through various interactions and processes as covered under following topics: Atmosphere: evolution of earth's atmosphere, composition and structure of the atmosphere, stratospheric ozone, significance, atmospheric temperature: maximum, minimum, mean temperature, temperature range, factors regulating atmospheric temperature/ temperature controls, lapse rate and types, temperature inversion & atmospheric stability	8	
	Atmospheric pressure on Earth, factors affecting the atmospheric pressure, atmospheric pressure winds, factors affecting winds, types of wind, fronts - frontogenesis and frontolysis	8	
	Cloud, cloud formation, types of cloud, precipitation, relative humidity, precipitation lapse rate, adiabatic cooling effect	4	
4	Module 4: Oceanography		
	This module introduces students to the various phenomena associated with the Earth's oceanic environment. Its focus is primarily to impart a basic understanding of how land-atmosphere-ocean interactions give rise to the entire system for supporting life on the Earth. The contents of this module are as follows: Oceans and their distribution, ocean topography, ocean temperature, salinity effect, density of seawater; dynamics of seawater: tides and waves, current; Indian tropical monsoon and Indian ocean; marine resources: red mud, coral reef, flora and fauna, atmosphere-ocean-land interaction	12	
	Total	60	
Evaluation criteria			
<ul style="list-style-type: none"> - Assignment: 20% - Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 15% - Minor Test 2: Written test [at the end of teaching of module 3] -- 15% - Major Test: Written test [at the end of the semester, full syllabus] -- 50% 			
Learning outcomes			
<p>Upon completion of the course, the students will be able to</p> <ul style="list-style-type: none"> - understand the various processes operating on the Earth's surface [Module 1; Minor Test 1] - understand the interactions between the Earth surface processes, atmosphere and oceans [Modules 2, 3 and 4; Minor Test 2 and Major Test] - develop a general understanding of how various abiotic processes and associated interactions support life on the Earth. [Modules 2, 3 and 4; Major Test] 			
Pedagogical approach			
<ul style="list-style-type: none"> • The course will be delivered through lectures that focus on developing a clear foundation of the core concepts of the Earth processes and associated interactions. • The course will also focus on classroom discussions and assignments to further develop the student's fundamental knowledge of the Earth processes. 			

Reading resources

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.

Garrison, T.S. (2012). *Oceanography: an invitation to marine science*. Cengage Learning.

Grotzinger, J., Jordan, T.H. (2010). *Understanding earth*. Macmillan.

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., Marshak, S. (2010). *Laboratory manual for introductory geology*. 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 University Press. Chicago.

Rutford, R.H., Carter, J.L. (2018). *Zumberge's laboratory manual for physical geology*. 16th Edition. McGraw-Hill Education, New York, USA.

Strahler, A.H., Strahler, A. (2013). *Introducing physical geography*. Wiley, Hoboken, NJ, USA.

Vatal, M., Sharma, R.C. (2017). *Oceanography for geographers*. Surjeet Publications.

Student Responsibilities

The students are required to come prepared with readings that are suggested during the class and ensure timely submission of assignments. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions.

Course Reviewers

The course is reviewed by following reviewers:

1. Dr. Ram Avtar, Associate Professor, Hokkaido University, Sapporo, Hokkaido 060-0808, Japan
2. Dr. Ashima Saikia, Associate Professor, Department of Geology, University of Delhi