Semester	AUG 2022
Open to semester	5,7,11,13,21
Course code	**EC3334/EC6534**
Course title	**Introduction to Interactive Spheres**
Credits	4 /4
Course Coordinator & participating faculty (if any)	Rahul Dahiya*,Arjun Datta, Neena Mani Joseph, Argha Banerjee,
Nature of Course	Lectures and Tutorials
Pre-requisites	none
Objectives (goals, type of students for whom useful, outcome etc)	The objective of the course is to introduce the basic concepts of solid earth geophysics and climate science.
Course contents (details of topics /sections with no. of lectures for each)	Whole Earth structure: chemical and mechanical subdivisions of Earth, role of global seismology, seismic structure, pressure and density variations with depth, phase changes in the mantle Plate tectonics 1 (qualitative): seafloor spreading, subduction of oceanic lithosphere and associated phenomena (e.g. sea-floor elevations, sealevel changes, seismicity including Wadati-Benioff zones, volcanism) Plate tectonics 2 (quantitative): relative plate motions, triple junctions, tectonics on a sphere Geomagnetism 1: the geomagnetic field, diurnal and secular variations, rock magnetism, palaeomagnetism, apparent polar wander and relationship with tectonics Rock rheology: elastic, plastic and ductile regimes, stress and strain, solid-state viscous flow Earth’s gravity: gravitational potential, figure of the Earth, rotation and ellipticity, Geoid Earth’s heat and thermal structure: geotherms, surface heat flux, depth and age of sea floor

	Seismology 1: theoretical foundations –continuum mechanics, seismic wave equation, body and surface waves Seismology 2: applications – earthquake location, estimation of Earth structure including seismic tomography Planetary Energy balance, daily and seasonal variability, climate forcing Formation and evolution of Earth's atmosphere, Composition, Thermal and dynamical structure of Earth's atmosphere, Interaction of radiation with atmospheric gases, Greenhouse effect Temperature, salinity and density variation in the oceans, wind driven circulation, surface currents, Ekman transport, subtropical gyres, upwelling, downwelling Thermohaline circulation, deep water masses, North Atlantic Deep Water, Antarctic Bottom water, Climate impact of Thermohaline circulation. Earth's Climate variability on short and long time scales, Tectonic scale climate change, Orbital variations, Milankovitch cycles. Water cycle and deep water cycles; carbon cycle and deep carbon cycle; Sea-level, sea-level change, and its tectonic and climatic control; Climatic and tectonic forcing of surface topography; interactions between climate and tectonic processes; The story of Himalayan orogeny.
Evaluation /assessment	End-Sem Examination-35% Mid-Sem Examination-35% Others-30%
Suggested readings (with full list of authors, publisher, year, edn etc.)	Lowrie, W. and Fichtner, A. 2020. Fundamentals of Geophysics (3rd ed.). Cambridge University Press.

	Fowler, C.M.R. (2004). The Solid Earth: An Introduction to Global Geophysics (2nd ed.). Cambridge University Press. The Earth System, 3rd Edition (2009), by LR. Kump, JF. Kasting and RG. Crane, Pearson. Earth's Climate: Past and Future, 2nd Edition (2008) by William F. Ruddiman, W.H. Freeman. Atmospheric Science: An Introductory Survey, 2nd Edition (2006), by JM. Wallace and PV. Hobbs, Academic Press.