Discipline Specific Elective (DSE-3): River Science (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)	No. of hours of Lectures	No. of hours of Tutorial	No. of hours of Practical	Total Hours of Teaching
		Lecture	Tutorial	Practical/ Practice						
DSE-3 River Science (L3, P1) **OR** **Introduction to Geophysics OR** **Paleoseismology: Concepts and Applications**	4	3	0	1	Class XII pass with Science	Studied Earth System Science, Sedimentary Geology and/or Equivalent at the UG level				

Learning Objectives

To understand the life cycle of a river especially in relation to societal development. To understand the process of erosion and transportation of sediments and its connection with the landforms

Learning outcomes

After going through this course, students will understand Rivers through geological time. They will know about fluvial degradational and aggradational processes. They can work with landforms associated with the rivers

SYLLABUS OF DSE-3

River Science (L3, P1)

UNIT – I (9 Hours)

Stream hydrology: Basic stream hydrology. Physical properties of water, sediment and channel flow. River discharge, River hydrographs (UH, IUH, SUH, GIUH) and its application in hydrological analysis; Flood frequency analysis

UNIT – II (9 Hours)
River basin: Sediment source and catchment erosion processes; Sediment load and sediment Yield; Sediment transport processes in rivers; Erosion and sedimentation processes in channel.

UNIT – III (9 Hours)
Drainage: Drainage network; Quantitative analysis of network organization - morphometry Role of drainage network in flux transfer;
Evolution of drainage network in geological time scale.

UNIT – IV (9 Hours)
Rivers in time and space: River diversity in space, Patterns of alluvial rivers - braided, meandering and anabranching channels, Dynamics of alluvial rivers; Channel patterns in stratigraphic sequences;
Different classification approaches in fluvial geomorphology and its applications.

UNIT – V (9 Hours)
Channels and Landscapes: Bedrock channels, Bedrock incision process; River response to climate, tectonics and human disturbance; Bedrock channel processes and evolution of fluvial landscapes. Fluvial hazards: Integrated approach to stream management.
Introduction to river ecology.

Practical Component- (30 Hours)
Exercises based on River visit during weekend, Stream power calculation, Longitudinal profile analysis, Hydrograph analysis, and Flood Analysis

Essential/Recmmended readings
Fryirs and Brierly (2013) Geomorphology and river management. Wiley-Blackwell Pub.
Julien, P.Y. (2002) River Mechanics. Cambridge University Press.

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OR

DSE-3: Introduction to Geophysics (L3, P1)

UNIT – I (9 Hours)
Interrelationship between geology and geophysics, Role of geology and geophysics in explaining geodynamical features of the earth.

UNIT – II (9 Hours)
General and Exploration geophysics: Different types of geophysical methods - gravity, magnetic, electrical and seismic; their principles and applications; Concepts and Usage of corrections in geophysical data

UNIT – III (9 Hours)
Geophysical field operations: Different types of surveys, grid and route surveys, profiling and sounding techniques; Scales of survey,

UNIT – IV (9 Hours)
Application of Geophysical methods. Regional geophysics, oil and gas geophysics, ore geophysics, groundwater geophysics, engineering geophysics, internal structure of the Earth based on major discontinuities in seismic velocities.

UNIT – V (9 Hours)
Geophysical anomalies: Correction to measured quantities, regional and residual (local) anomalies, factors controlling anomaly, and depth of exploration.
Integrated geophysical methods: Ambiguities in geophysical interpretation, planning and execution of geophysical surveys

Tutorials (30 Hours)

Calculating the free air and Bouguer anomalies.
Determining the gravity anomaly arising due to density contrast in the subsurface.
Calculating paleolatitude and paleopole.
Numerical problems on resistivity survey.
Problems on seismic survey.

Essential/Recommended readings

Kearey, P., Brooks, M. and Hill, I., 2002. *An Introduction to Geophysical Exploration* . Third Edition. Blackwell Publishing.
Lowrie, W. (2007). Fundamentals of geophysics. Cambridge University Press.
Mussett, A.E. and Khan, M.A., 2000. *Looking into the Earth: An Introduction to Geological Geophysics*. Cambridge University Press.
Bhimasankaram, V.L.S. (1990). Exploration Geophysics - An Outline by, Association of Exploration Geophysicists, Osmania University, Hyderabad.
Dobrin, M.B. (1984) An introduction to Geophysical Prospecting, McGraw-Hill, New Delhi.

Recommended readings

Bhimasankaram, V.L.S. (1990). Exploration Geophysics - An Outline by, Association of Exploration Geophysicists, Osmania University, Hyderabad.
Dobrin, M.B. (1984) An introduction to Geophysical Prospecting, McGraw-Hill, New Delhi.
Telford, W. M., Geldart, L. P., & Sheriff, R. E. (1990). Applied geophysics (Vol. 1), Cambridge University press.

*** Course content of Paleoseismology to be added.