

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSE-9 Applied Stratigraphy (L3, P1)	4	3	0	1	12 th pass with science	Studied Earth System Science and Structural Geology, Hydrogeology or Equivalent

Learning Objectives:

- Understand the concepts of dynamic stratigraphy.
- Analyze how eustasy, sediment supply, and tectonics influence basin filling history in the space-time domain.
- Learn the role of magnetic signatures and isotopic values in interpreting sedimentary basin evolution.

Learning Outcomes:

- Apply knowledge in the fields of oil and gas exploration, sustainable energy, and isotope geochemistry.
- Be equipped for advanced research and industry roles requiring stratigraphic and geochemical interpretation.

THEORY

(45 Hours)

UNIT I: Sequence Stratigraphy

(12 hours)

Historical developments. Definitions and key concepts. Base level changes, Geomorphic and Stratigraphic base level. Transgressions and regressions, T-R cycles.

Stratigraphic surfaces: Stratal terminations, sequence stratigraphic surfaces; surface and sub-surface signature

Unconformity and correlative conformity, Ravinement surface, Initial and maximum flooding surface.

Systems Tracts: Lowstand, Transgressive, Highstand, Falling stage.

UNIT II: Sequence models and their application in hydrocarbon sector (11 hours)

Sequence Models: Depositional sequence (Type I, II, III), Genetic stratigraphic sequence, Transgressive-Regressive sequence. Hierarchy of sequences and bounding surfaces.

Application of sequence stratigraphy in hydrocarbon exploration; stratigraphic trap delineation

Concepts of event stratigraphy.

UNIT III: Magnetic Stratigraphy**(11 hours)**

Principles, Earth Magnetism, The magnetization process, Inclination, Declination
Paleomagnetism, Magnetic epochs, magnetic properties of marine sediments.

Fundamentals of reversal magneto-stratigraphy, The Plio-Pleistocene reversal record

Magnetic stratigraphy of Cenozoics

UNIT IV: Isotope stratigraphy**(11 hours)**

Geochemistry of stable isotope (C, O, S). Application of stable isotopes: Oxygen and hydrogen in Paleothermometry, and Paleoclimatology. Carbon in modern biosphere, sedimentary rocks of Precambrian age, and marine and nonmarine sediments.

PRACTICALS:

1. Problems on paleoenvironmental interpretation
2. Problems on sequence stratigraphic surfaces (unconformity, BSRF, Correlative conformity, Transgressive surface, Maximum flooding surface)
3. Problems of stratigraphic correlation and identification of proximal-distal relationship
4. Problems involving different branches of stratigraphy

Suggested Readings:

- Sequence Stratigraphy: D. Emery, and K. Meyers (1996) Blackwell Publishers
- Principles of Sequence Stratigraphy Octavian Cateneanu (2006) Elsevier
- Basin Analysis: Principles and Applications: P. A. Allen and J.R. Allen (1990) Blackwell Publishing
- The geology of stratigraphic sequences: A.D. Miall (1997) Springer