

THEORY:**Introduction to the course:**

The course provides advanced knowledge on the contribution of Biostratigraphy to modern stratigraphic analyses.

Course Objectives:

The aim of the course is:

1. To understand the biostratigraphic concepts and methods.
2. To provide students with the practical skills for the reconstruction of the palaeoenvironment and palaeoclimate.

Course Contents:**1. Basic Principles:**

- 1.1. Introduction to sedimentary and stratigraphical paleopalynology, paleopalynology as an important stratigraphical tool.
- 1.2. Classification of stratigraphic units.
- 1.3. Concept of Zone, stratigraphic ranges, overlapping ranges, time units, index fossils (Palynomorphs), index species, biogeographic province.
- 1.4. Introduction to the International code of stratigraphical nomenclature.

2. Biostratigraphic units:

- 2.1. Concept of Biozone and principal categories of zones viz., Interval Zone (Sub Zone), Taxon Range Zone, Concurrent Range Zone, Partial Range Zone, Lineage Zone, Assemblage Zone, Composite assemblage Zone, Opeel Zone, Acme Zone.
- 2.2. Ranking and naming biostratigraphic units.

3. Biocorrelation:

- 3.1. Correlation by Assemblage Zones, Abundance Zones, Biologic interval Zones, Taxon Range Zones, other interval Zones, Biogeographical Acme Zones.
- 3.2. Recent advances in the Salt Range Paleozoic and Mesozoic biostratigraphy.

Practicals:

1. Field study tour to the Salt and Murree Ranges to identify and classify major sedimentary rocks including lithological description.
2. Use of clinometer, Map reading.
3. Palynological biostratigraphy of some late Paleozoic and Mesozoic rocks of the Salt Range, Pakistan.
4. Extraction, identification and technical description of palynomorphs to identify Biostratigraphic Zone(s) across a particular geological strata.
5. Data Management in Biostratigraphy.

Teaching-learning Strategies

1. Lectures
2. Group Discussion
3. Laboratory work
4. Field visits/ Workshop

Learning Outcome:

Knowledge and understanding of:

1. Analysis of the geological framework, and identification of the problem to be solved
2. Selection of the best biostratigraphic tools with respect geological/stratigraphical framework
3. Selection of the more appropriate biostratigraphic method
4. Evaluation of the results

Assessment Strategies:

1. Lecture Based Examination (Objective and Subjective)
2. Assignments
3. Class discussion
4. Quiz
5. Tests

Recommended Readings:

1. Biostratigraphy of Fossil Plants. Edited by David L. Dilcher and Thomas N. Taylor, 1980. Dowden Hutchinson and Ross, Inc.
2. Stratigraphy of Pakistan. Memoir No.10, 1977. Geological Survey of Pakistan.
3. Earth's Earlier Biosphere, its origin and evolution, 1983. J.W. Schopf. Princeton University Press Princeton. New Jersey.
4. Fossils and Climate, 1984. P.J. Brenchley. Jhon Wiley and Sons Inc., New York.
5. Gondwana Geology, 1975. K.S.W. Campbell. Australian National University Press, Canberra.
6. Life and its Environment on the Early Earth, 1981. Nargulis, L., W.H. Freeman and Co., San Francisco.
7. Evolutionary Botany and Biostratigraphy, 1984. A.K. Sherma, G.C. Mitra and M. Banerjee. Today and Tomorrow's Printers and Publishers, New Delhi.
8. Palaeopalynology. Alfred. A. Traverse, 1988. Unwin Hymen N.Y.
9. Microfossils. M.D. Brasiev, 1985. London George Allen Unwin.
10. Essentials of Map Reading. Nazir Ahmad, 1978. Army Education Press, Rawalpindi.
11. Techniques of Extracting Palynomorphs from Sediments. Phipps D. and Palyford.G., 1984. Dep. of Mineralogy and Geology Sp. Pub. Univ. Queensland. Brisbane. Australia.
