Bot-307 & 308 EVOLUTIONARY TRENDS AMONG VASCULAR CRYPTOGAMS

Credit Hours 3(2+1)

Theory

Introduction to the course:

The course aims to present the major groups of vascular cryptogamic plants to explore their morphology and evolution.

Course Objectives:

The aim of the course is to provide an adequate knowledge of tracheophytes and their evolutionary importance with special emphasis on vegetative and reproductive biology including morphology of lower vascular Land plants.

Contents:

1. **Evolution:** Definition. Convergent, Divergent and Homoplastic evolution. Evolutionary Forces and Trends. Modern concept of Evolution.
2. **Plant fossils:** Types, Preservation, Nomenclature.
3. **Palynology:** Neopalynology and Palaeopalynology; Definition, Palynomorph Categories, Applications, Durability, Significance of Evolution in Palynology, Palynomorphs as markers of Evolution.
4. **Steller system:** Classification and Evolution. Maturation pattern of xylem.
5. **Vascular cryptogams:**
    - **5.1. Psilopsida:** General Characters, Classification (*Rhyniophyta, Zosterophyllophyta, Trimerophyllophyta*), Affinities and Phylogenetic importance. Selected palynomorph genera representing above mentioned Divisions of Psilopsida and their morphographic description.
    - 5.2. **Lycopsida:** General Characters, Classification (*Drepanophycales, Protolepidodendrales, Lepidodendrales, Lycopodiales, Selaginellaes, Pleuromiales, Isoetales*), Affinities and Phylogenetic importance. Selected palynomorph genera representing above mentioned Lycopsid orders and their morphographic description.
    - 5.3. Sphenopsida: General Characters, Classification (*Pseudoborniales, Sphenophyllales, quisetales*), Affinities and Phylogenetic importance. Selected palynomorph genera representing above mentioned Sphenopsid orders and their morphographic description.
    - 5.4. Pteropsida

    Ferns: General Characters, Classification and Phylogenetic importance of

    a. Eusporangeate Ferns (*Ophioglossales, Marratiales*)

    b. Leptosponargiate Ferns (*Filicales, Marseliales, Salviniales*)

6. Selected palynomorph genera representing above mentioned Pteropsid orders and their morpho graphic description.

Practicals:

1. Study of Different types of rocks (Igneous, Sedimentary, Metamorphic).
2. Different techniques involved in studying fossils and age determination.
3. Examination of representative plants mentioned in the syllabus through live and preserved specimens (including prepared slides).
4. Study of Geological Time Scale – major and minor revolutions.
5. Field Study Tour (mandatory) to the Lesser / Higher Himalayas to collect and identify Vascular Cryptogams as given in the syllabus. Rock samples from various stratigraphically measured geological Formations shall be collected to isolate

Palynomorphs of Vascular Cryptogams mentioned in the theory section. Detailed Field Report will be submitted by each pupil at the time of practical examination carrying separate marks apart from Practical Note Book.

6. Free hand drawings (or Camera Lucida) of isolated and properly identified palynomorphs of Vascular Cryptogams along with the brief morphological description.

Teaching-learning Strategies

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

Learning Outcome:

Students will be able to:

1. Develop better understanding of the concept of evolution and modern evolutionary trends.
2. Know about the evolutionary architecture of early vascular land plants, Lycophytes, Sphenophytes and Ferns.

Assessment Strategies:

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

Recommended Readings:

1. Andrews, H.W. (Latest Edition). Studies in Paleobotany. John Wiley and Sons.
2. Bierhorst, D.W. (Latest Edition). Morphology of Vascular Plants. Macmillan, Inc. Insurance, New York.
3. Eames, A.J. (Latest Edition). Morphology of Vascular Plants (Lower Groups). McGraw Hill and Co.
4. Foster and Gifford, (Latest Edition). Comparative Morphology of Vascular Plants, W.H. Freeman, New York.
5. Jeryme, A.C., Ciabbe, T. A. and Thomas, B. A. (Latest Edition). The phylogeny and classification of Ferns, Academic Press, London.
6. Lithostratigraphic Units of the Kohat, - Potwar Province, Indus Basin Pakistan, 1980. Memoir Volume No.10. Geological Survey of Pakistan.
7. Niklas, K. J. (2016). Plant Evolution: an introduction to the history of life. Chicago; London: The University of Chicago Press, 2016. 566 pp.
8. Niklas, K. J. (1981). Paleobotany, Paleoecology and Evolution. Praeger Press, New York.
9. Sporne, K.R. (Latest Edition). The morphology of Pteridophytes. Hutchinson University Library.
10. Taylor, E. L., Taylor T. N. and Krings, M. (2009). Biology and Evolution of Fossil plants. Princeten Hall, New York. 1252 pp.
11. Traverse, A. (2007). Paleopalynology. Unwin Hyman Ltd. 813 pp.

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