



Institute of Botany
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline
Semester – VIII



Programme	BS Botany	Course Code	Bot-411	Credit Hours	2
Course Title	Evolutionary Trends in Plants (Theory)				
Introduction					
To highlight the significance of the major Evolutionary Trends in the Plant groups through exploring their Morphology, Anatomy, Reproductive Biology and other allied characters.					
Learning Outcomes					
On the completion of the course, the students will be able to:					
<ul style="list-style-type: none"> • Appreciate the evolutionary forces leading to the divergence / Convergence of various plant groups. • Understand when seed plants first appeared and why the gymnosperms became the dominant plant group • Comprehend the two major innovations that allowed seed plants to reproduce in the absence of water • Describe the significance and the evolution of the Angiosperms bearing both flowers and fruit, ultimately becoming the most complex and dominant vegetation on Earth. 					
Course Contents					
<ul style="list-style-type: none"> • Evolution: Definition. Convergent, Divergent and Homoplastic evolution. Evolutionary Forces and Trends. Modern concept of Evolution. • Structure of the Earth, Plate Tectonics, the Super Continent Pangea, Laurasia, Tethys and Gondwanaland. • Geological Time Scale • Mega and Micro Plant Fossils, Concept of Form genera and Form Species • Origin of Land Plants and their Form and Structure <ul style="list-style-type: none"> • Diversification of the early Vascular Land Plants (Psilopsids, Lycopsids, Sphenopsids and Pteropsids), their morphology, reproductive biology and important modifications for adaptation on land. • Origin of Tree Habit, Secondary Growth and Forests • Origin and Evolution of Seed Habit including evidences from Palynology <ul style="list-style-type: none"> • Transition from Homospory to Heterospory • Retention of Megaspores • Origin of ovules and seeds • Rise of Seed Plants • Seed Ferns: General Characters and Phylogenetic importance of <ul style="list-style-type: none"> • Palaeozoic Seed Ferns (Calamopityales, Lyginopteridales, Medulosaes, and Glossopteridales) • Mesozoic Seed Ferns (Caytoniales) • <i>Selected Palynomorph</i> Genera representing above mentioned Seed Ferns and their Morphographic description. • Gymnosperms: Origin of Gymnosperms, Phylogeny and Classification. Selected Palynomorph Genera representing Gymnosperms and their Morphographic description to depict evolution. • Angiosperms: <ul style="list-style-type: none"> • Life cycle of an Angiosperm • Flower: Definition, different parts of a generalized flower. • Morphological Nature of flower, Different types of Placentation and their inter-relationship. • Origin of Angiosperms • Embryology: Structure of Stamen, Microsporogenesis and Structure of pollen; Structure of an Ovule, Megasporeogenesis. Different types of Embryo Sacs. Nature of Endospermic Tissue. Selected 					

Palynomorph genera representing various groups of Angiosperms and their Morphographic description.

Programme	BS Botany	Course Code	Bot-407	Credit Hours	1
Course Title	Evolutionary Trends in Plants (Lab)				
Lab Course Contents					
<ul style="list-style-type: none"> • Free hand section cutting, staining and permanent / temporary mounting of the representative specimens mentioned in the theory portion. • Study of Different types of Rocks (Igneous, Sedimentary, Metamorphic). • Different techniques involved in studying fossils and age determination. • Isolation of Palynomorphs through Maceration from samples of Mesozoic and Paleozoic Rocks of Pakistan. • Study of different types of Placentation in different flowers. • Study of different types of Embryo Sacs in Angiosperms. • Field Study Tour (mandatory) to the Lesser / Higher Himalayas to collect and identify specimens as given in the syllabus. Rock samples from various stratigraphically measured geological Formations shall be collected to isolate Palynomorphs of Seed Ferns, Gymnosperms and Angiosperms mentioned in the theory section. Detailed Field Report will be submitted by pupils at the time of practical examination carrying separate marks apart from Practical Note Book. • Free hand drawings (or Camera Lucida) of isolated and properly identified Palynomorphs along with the brief morphological description. 					
Textbooks and Reading Material					
<ol style="list-style-type: none"> 1. Wang, X. (2018). The Dawn Angiosperms: Uncovering the Origin of Flowering Plants, Second Edition, Springer, p. 407. 2. Beck. C.B. Origin and Evolution of Gymnosperms. Columbia University Press, New York. 3. Beck. C.B. Origin and Evolution of Angiosperms. Columbia University Press, New York 4. Chamberlain, C.J. (Latest Edition). Gymnosperms structure and Evolution. Dover Publications Inc. 480 pp. 5. Foster, S. and Gifford, E.M. (1971). Comparative Morphology of Vascular Plants, W.H. Freeman, New York. 751 pp. 6. Niklas, K. J. (2016). Plant Evolution: an introduction to the history of life. Chicago; London: The University of Chicago Press, 2016. 566 pp. 7. Sporne, K.R. (Latest Edition). The morphology of Gymnosperms. Hutchinson University Library. 8. Taylor, E. L., Taylor T. N. and Krings, M. (2009). Biology and Evolution of Fossil plants. Princeten Hall, New York. 1252 pp. 9. Traverse (2007). Paleopalynology. Unwin Hyman Ltd. 813 pp. 10. Stussey, T.F. (2009) Plant Taxonomy: The Systematic Evolution of Comparative Data. Columbia University Press, New York 11. Simpson, M.G. (2019) Plant Systematics. Elsevier Pub Simpson, M. (2010). Evolution and Diversity of Vascular Plants. 10.1016/B978-0-12-374380-0.50004-X. 12. Steeves TA, Sussex IM. (1989). Patterns in Plant Development. 2nd ed. Cambridge University Press. 13. National Academy of Sciences. 2000. <i>Variation and Evolution in Plants and Microorganisms: Toward a New Synthesis 50 Years After Stebbins</i>. Washington, DC: The National Academies Press. https://doi.org/10.17226/9766. Francisco J. Ayala, Walter M. Fitch, and Michael T. Clegg, Editors 					
Teaching Learning Strategies					
<ul style="list-style-type: none"> • Lectures • Seminar/ Workshop • Group Discussion • Laboratory work 					
Assignments: Types and Number with Calendar					
<ul style="list-style-type: none"> • Lecture Based Examination (Objective and Subjective) • Quiz • Assignments • Tests • Class discussion 					
