

DEPARTMENT OF BOTANY
SCHOOL OF LIFE SCIENCES
 (Approved by Academic Council on 28.05. 2010)

SYLLABUS FOR PH.D COURSE WORK

Duration of the Course: ONE Semester

Total Credits: 12

| Paper | Name of the paper | Paper No | Credit |
|-------|----------------------|------------|--------|
| 1 | Research Methodology | SLS-PhD-01 | 4 |
| 2 | Plant Sciences | BOT-PhD-02 | 4 |
| 3 | Review of Literature | BOT-PhD-03 | 4 |

SLS-PhD-01: Research Methodology (4 Credits)

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| Unit-I | Microscopy: Fluorescent and Confocal; Electron microscopy: SEM and TEM, In-situ hybridization techniques: FISH, GISH and MCFISH; Chromosome painting |
| Unit-II | Centrifugation, Chromatography: Ion-exchange, Gel filtration, Affinity, HPLC and GC; Spectroscopy: Fluorescent, MS and AAS; Electrophoresis and Isoelectric focusing. |
| Unit-III | DNA and RNA extraction; Preparation of cDNA, RT-PCR; Designing of primers; Real Time PCR; DNA cloning; Southern, Northern and Western blots; DNA and protein sequencing; ELISA and RIA |
| Unit-IV | Bio-computing: Biological database (protein, nucleotide and natural products); BLAST and FASTA; Sequence comparison and alignment techniques, Phylogenetic analysis-tree building methods and its evaluation – Bootstrapping; Bibliographic resources. PubMed and Plos; Use of statistical packages for ANOVA and Multiple regression. |

Suggested Readings:

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| <i>Harris R (ed.) (1991). Biological Microscopy for Biology: A Practical Approach, Oxford, IRL Press</i> |
| <i>Letovsky, S. I (1999). Bioinformatics. Kluwer Academic Publishers.</i> |
| <i>Lesk, A. M (2002). Introduction to Bioinformatics, Oxford University Press.</i> |
| <i>Maniatis, T. et.al. (1982). Molecular Cloning: A laboratory Manual, Cold Spring</i> |
| <i>Murad, H and Atique, M. V. A (1991). Biological Techniques in Electron Microscopy, CBS Publication</i> |
| <i>Nelson, D. L and Cox, M. M (2009). Principles of Biochemistry. 5th Edition</i> |
| <i>Plummer, D. T (1987). An Introduction to Practical Biochemistry, 3rd Edition, Tata Mc Graw Hill</i> |
| <i>Stiles et al (1991). Basic and Clinical Immunology, Prentice Hall International Inc.</i> |
| <i>Switzer, R. L., and Garry L. F. (1999). Experimental Biochemistry, 3rd Edition, W. H. Freeman Company.</i> |
| <i>Wilson, K and Walker, J (1994). Principles and Techniques of Practical biochemistry, Cambridge University Press.</i> |
| <i>Setubal, J. and Meidanis, J. (1996). Introduction to computational molecular Biology, PWS Publishing Co., Boston</i> |
| <i>Zar, R (1974). Biostatistic Analysis, Prentice Hall Inc.</i> |
| <i>SPSS -2010, SPSS Inc., USA.</i> |

| BOT-PhD-02: Plant Sciences (4 Credits) | |
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| Unit-I | Quantitative ecology: quantitative community characteristics, application of multivariate analysis in community studies, population growth and competition models, monitoring plant diversity and diversity indices; plant diversity and strategies for management; Concepts of systematic botany, taxonomic literature; floras, taxonomic accounts, revisionary studies, plant diversity of vascular plants with emphasis on angiosperms. |
| Unit-II | Biotechnological approaches in plant improvement and conservation in vitro technologies of propagation; molecular marker, diagnostic, cryopreservation, Plant growth reproduction: growth in secondary plant body, sexual reproduction and its application; Physiology of seed ageing. |
| Unit-III | Regulation of metabolic pathways; Macromolecular interactions: protein-protein, protein-nucleic acids, protein-carbohydrates; DNA based molecular markers and marker assisted selection. |
| Unit-IV | Application of microbes in agriculture and forestry; Industrial production of alcohol and organic acids; Rhizosphere microflora and its significance; Biological control of plant diseases; Fungal bioremediation, Algal bioresources and its importance, Algae as source of alternative food, fodder, fertilizer and renewable energy; natural colours, bioactive compounds, Phytochemicals with pharmaceutical and biotechnological applications. |
| Suggested Readings: | |
| | <i>Alberts, B. et al. (2002). Molecular Biology of the cell. Garland</i> |
| | <i>Buvat, R. (1988). Ontogeny, Cell differentiation and structure of vascular plants. Springer-verlag, Germany.</i> |
| | <i>Bewley, J.D and Black, M (1994). Seeds: Physiology of Development and Germnation. Plenum Press.</i> |
| | <i>Bhojwani, S.S and Bhatnagar, S. P (2000). The embryology of angiosperms. Vikas Publishing House.</i> |
| | <i>Chawla, H. S. (2009). Introduction to plant biotechnology (3rd ed.), Science Publishers, USA</i> |
| | <i>Clark, M. S. and Wall, W. J. (1996). Chromosomes. Chapman & Hall Dekker Inc.</i> |
| | <i>Cronquist (1968). The evolution and classification of flowering plants. Nelson.</i> |
| | <i>Dubey, R.C and Maheshwari, D. K. (1999). A text book of microbiology, S. Chand & Company</i> |
| | <i>Eisenthal, R and Danson, M.J (2006). Enzyme assays, Oxford University Press</i> |
| | <i>Elrod, S and Stanfield, W. (2004). Genetics, Tata MCGraw-Hill</i> |
| | <i>Graham, J.E., Graham, L.E and Wilox, L. E. (2009). Algae. Benjamin Cummings</i> |
| | <i>Greig-Smith, P. (1983). Quantitative plant Ecology, (3rd ed.), Blackwell Scientific Publicatons.</i> |
| | <i>Gupta, P. K. (2004). Biotechnology and genomics. Rastogi & Co.</i> |
| | <i>Heldt, H (1997). Plant iochemistry and molecular biology. Oxford University Press.</i> |
| | <i>Henry, A. A. and Chandrabose, M (1979). An aid to international code of botanical nomenclature.</i> |
| | <i>Horton, H. R., Moran, L. A., Scrimgeour, K. G., Perry, M. D. and Rawn, J. D. (2006). Principles of biochemistry, (4th ed.) Pearson-Prentice Hall.</i> |
| | <i>Hutchinson, J (1973). The families of flowering plants (3rd ed.), Clarendon Press Oxford.</i> |
| | <i>Iqbal, M. (1994). Growth patterns in vascular plants, Timber Press, Germany.</i> |
| | <i>Jain, S. K. (ed.) (1981). Glimpses of Indian ethnobotany. Oxford</i> |
| | <i>Jain, S. K. and Rao, R. R. (1977). A handbook of field and herbarium methods. Today & Tomorrow, New Delhi.</i> |
| | <i>Khattar, J. (2009). Biology and biotechnology. I. K. International Pvt. Ltd.</i> |
| | <i>Kiri-Marja O., Wolfgang, B. (Eds.) (2002). Plant biotechnology and transgenic plants, Marcel Dekker.</i> |
| | <i>Lee, R (1999). Phycology (3rd eds.), Cambridge University Press.</i> |
| | <i>Lewin, B. (2004). Genes VIII, Pearson-Prentice Hall Ltd., New Delhi</i> |
| | <i>Mishra, R. R. (1996). Soil microbiology, CBS Publ.</i> |

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| | Misra, R. (1968). <i>Ecology work book</i> . Oxford and IBH Co. Ltd. |
| | Poole, R. W. (1974) <i>An Introduction to Quantitative Ecology</i> , McGraw-Hill Inc. |
| | Prescot, L. M, Harley, J. P., Klein, D. A. (2005). <i>Microbiology</i> (6 th eds.) Mc Graw-Hill Press. |
| | Radford, A. R. (1986). <i>Fundamentals of plant systematic</i> , Harper Row. |
| | Raghavan, V. (1999). <i>Development biology of flowering plants</i> . Springer-Verlag |
| | Sporne, K. R. (1974). <i>The morphology of angiosperms</i> . Hutchinson University Press. |
| | Stohlgren, T. J. (2007). <i>Measuring plant diversity, Lessons from the field</i> , Oxford University. |
| | Strickberger, M. W. (1985). <i>Genetics</i> , Maxmillan |
| | Susan, A. L., Douglas, E. and Ravan, J. A. (2004). <i>Photosynthesis in algae</i> , Kluwer Acad. Pub, Netherlands. |
| | Sybenga, J. (1972). <i>General Cytogenetics</i> , North Holland |
| | Taktajan, A. (1997). <i>Diversity and classification of flowering plants</i> , Columbia Univ. Press |
| | Tamarin, R. H. (2002). <i>Principles of Genetics</i> . Tata McGraw-Hill. |
| | UNEP (1995). <i>Global biodiversity assessment</i> . Cambridge University Press. |
| | Van Laar, A and Akca, A. (2007). <i>Forest mensuration (Managing Forest Ecosystems)</i> , vol. 13, Springer |
| | Watson, J. D. et al. (2004). <i>Molecular biology of the gene</i> , Pearson Education. |
| BOT-PhD-03: Review of Literature (4 Credits) | |
| I | Review of literature and submission of report: 3 Credits |
| II | Seminar presentation on area relevant to research topic: 1 Credit |
