

**Kohima Science College, Jotsoma**

**Syllabus**

**for**

**DOCTOR OF PHILOSOPHY**

**Course Work in**

**BOTANY**

**Department of Botany  
Faculty of Science  
Kohima Science College, Jotsoma  
Kohima – 797002.**

**Department of Botany**  
**Kohima Science College, Jotsoma**  
*(An autonomous Government PG College)*  
 Kohima, Nagaland

Syllabus for Ph.D. Course Work, 2021  
 (One Semester duration with a total of 16 Credits)

**Course Work (SEMESTER I)**

Course Code	Course Title	Credit	Maximum Marks
BOT-01*	Research Methodology	4	100
BOT-02*	Plant Sciences	4	100
BOT-03**	Elective Course	4	100
BOT-04*	Literature Review and Seminar	4	100
Total		16	400

\*Courses BOT-01, Course BOT-02 and BOT-04 are mandatory.

\*\*Elective Course (BOT-03) will be offered as per the availability of research position in the department. More elective papers will be introduced in the coming years depending upon the availability of the expertise of supervisors.

**ELECTIVE COURSES (BOT-03)#**

Course Code	Course Name	Credit	Max. marks
BOT-03a	Plant Taxonomy	4	100
BOT-03b	Techniques in Molecular Biology	4	100
BOT-03c	Mycology	4	100
BOT-03d	Microbiology and Plant Pathology	4	100
BOT-03e	Plant Ecology and Plant Diversity	4	100
BOT-03f	Agroecosystem Analysis	4	100

#Each student will be required to take one elective from the given options in consultation with the supervisor.

Each credit is equivalent to 7 hrs of Theory and 8 hrs of Tutorials/ Practicals/ Seminars/ Instrumentation.

## **BOT-01: Research Methodology (4 Credits)**

### ***Unit 1: Research principles***

Research - meaning, objectives, types. Criteria of good research, formulation of research questions; research methods and methodology.

### ***Unit 2: Research ethics***

Responsible conduct of research, falsification and fabrication of data. Plagiarism- concept, software, legal aspects. Intellectual Property Rights (IPR) - patents, copyrights and related issues.

### ***Unit 3: Biostatistics***

Experimental design-completely randomize design and randomize block design; Null and alternative Hypotheses, Regression and correlation; Use of t-test and F-statistics, Analysis of Variance (ANOVA). Application of statistical software.

### ***Unit 4: Scientific writing***

Structures of research proposals, synopsis, research paper writings. Scientific paper presentation in seminar and conference-oral and poster. Basic idea about the Impact factor of a journal.

## **BOT-02: Plant Sciences (4 Credits)**

### ***Unit 1: Angiosperm Taxonomy and Plant Physiology***

Herbarium techniques; Plant identification: Methods of plant identification, Taxonomic keys. Taxonomic Data Sources; Recent trends in classification of Angiosperms taxonomy.

Biochemical techniques: Centrifugation, Chromatography, Electrophoresis, Colorimetry and Spectrophotometry. Enzymes: types and assay. Growth regulators: types and their bioassay.

### ***Unit 2: Biotechnology, Cell and Molecular Biology***

Plant Tissue Culture, Composition of media; Nutrient and hormone requirements. Tissue culture applications.

Restriction Endonucleases, Cloning Vectors. Bacterial Transformation and selection of recombinant clones. Applications of Biotechnology.

Ultra-structural details of Prokaryotic and eukaryotic Cell. Cell wall architecture, Plasmodesmata, Mitosis, meiosis.

Types of DNA and RNA. Genetic code. Nucleic acid extraction; Preparation of cDNA.

### ***Unit 3: Microbiology, Mycology and Plant Pathology***

Culture techniques, Media Preparation (PDA, Nutrient Agar, MS Media), Sterilization techniques (Physical and Chemical), Isolation, purification and maintenance of microorganisms.

Effects of pathogen on host physiology, genetic basis of host-pathogen interaction- Pathogenesis, host defence mechanisms, epidemiology, assessment and forecasting of plant diseases.

#### ***Unit 4: Ecology, Environment and Agroecology***

Ecology and economics; human dimension in ecosystem management and conservation with focus on roles of tribal communities of India; Plant community analysis; concept of agroecology and agroecosystem; properties of agroecosystem; approaches to agroecosystem analysis.

#### **BOT-03: Elective Course (4 Credits)**

##### **BOT- 03a: Plant Taxonomy**

Importance of systematics in society; Plant Classification: Phenetic methods, molecular systematics, cladistic methods, phylogenetic analysis, APG classification; Plant nomenclature

Reference books:

- Singh Gurucharan 2010. Plant systematic: An Integrated approach. Science publisher. USA.
- Judd, W.S., Campbell, C.S., Kollogg, E.A., Stevens, P.F. and Donoghue M.J.2008. Plant systematic: phylogenetic approach. Sircuier Associates, Inc.

##### **BOT- 03b: Techniques in molecular biology**

PCR, PCR modifications. RFLP, RAPD, AFLP, CAPS. Southern, Northern and Western blotting. DNA sequencing methods. ELISA. Microarrays. Gel electrophoresis. Autoradiography.

##### **BOT-03c: Mycology**

Laboratory rules, tools and equipment of microbiological laboratory, Microscopy and Micrometry, Staining and Mounting of fungi and VAM. Isolation and enumeration of fungi from soil, air, water, rhizosphere and phyllosphere (phylloplane) by serial dilution-agar plating method and Warcup method. Isolation of Vesicular-Arbuscular mycorrhizal spore from soil, inoculation of plants with mycorrhizal fungi. Methods of obtaining pure culture (Streak-plate method, pour-plate method and sub-culturing method). Identification of microfungi and macrofungi.

##### **BOT-03d: Microbiology and Plant Pathology**

Ecology of microorganisms, different ecological groups, plant-microbe interactions, destructive and beneficial associations, Microbes in plant protection: biological control of plant pathogens, Mechanism-bioinsecticides, bioherbicides, biofungicides, application of microbes in agriculture and in forestry, microorganisms as source of food-single cell proteins, mushrooms.

##### **BOT-03e: Plant Ecology and Plant Diversity**

Schools of ecology, phytosociology, key concepts of vegetation science, major forest types of India with focus on Eastern Himalayas, field methods in plant ecology, sampling design, data management and analysis, plant biodiversity and its measurement, IUCN.

**BOT-03f: Agroecosystem Analysis**

Review of agroecosystems of the world. Current status on production, management and economic importance of major food crops- cereals, legumes and spices. Study of agroecosystems with special emphasis on agroecology of Nagaland.

**BOT-04: Literature Review and Seminar (4 Credits)**

Students will be required to do a literature review on a specified topic and give a seminar presentation. This will be done in consultation with the Ph.D. supervisor.

Examination: Viva based on seminar presentation.