

BHAGWANT UNIVERSITY

Sikar Road, Ajmer

Rajasthan



Syllabus

Institute of Life Science & Applied Sciences

M. Phil I Semester

Botany

Course Category

MBot : M.Phil in Botany

CCC: Compulsory Core Course

ECC: Elective Core Course

Contact Hours:

L: Lecture

T: Tutorial

P: Practical or Other

Marks Distribution :

IA: Internal Assessment (Test/Classroom Participation/Quiz/Presentation/Assignment etc.)

EoSE: End of Semester Examination

M. Phil (Botany)

(Course Structure)

Subject code	Subject Name	Teaching hours			Marks		
		L	T	P	External	Internal	Total
01MBot101	Research Methodology: Theory & Techniques	3	0	0	70	30	100
01MBot102	Advanced Cytogenetics	3	0	0	70	30	100
01MBot103	MICROBIOLOGY AND INDUSTRIAL	3	0	0	70	30	100

	BIOTECHNOLOGY						
01MBot104	PLANT CELL, TISSUE AND ORGAN CULTURE	3	0	0	100		100
Total		12	0	0	280	120	400

SEMESTER II

Subject code	Subject Name	Teaching hours			Marks		
		L	T	P	External	Internal	Total
02MBot101	Advanced Research Methodology	3	0	0	70	30	100
02MBot102	– Plant Hormones (Biosynthesis, Signal Transduction and Action)	3	0	0	70	30	100
02MBot103	Molecular Toxicology	3	0	0	70	30	100
02MBot104	Dissertation	3	0	0	50	50	100
Total		12	0	0	260	140	400

Research Methodology Theory And Techniques

Course/Paper: O1MBot101

Unit - 01

Research - definition - importance and meaning of research - characteristics of research - types of research - steps in research - identification, selection and formulation of research problem – research questions - research design - formulation of hypothesis - review of literature

Unit - 02

Sampling techniques : sampling theory - types of sampling - steps in sampling - sampling and non-sampling error - sample size - advantages and limitations of sampling. Collection of data : primary data - meaning - data collection methods - secondary data - meaning - relevances, limitations and cautions.

Unit - 03

Statistics in research - measure of central tendency - dispersion - skewness and kurtosis in research. Hypothesis - fundamentals of hypothesis testing - standard error - point and interval estimates - important non-parametric tests : sign, run, kruskal - wallis tests and mann-whitney test.

Unit - 04

Para metric tests : testing of significance - mean, proportion, variance and correlation - testing for significance of difference between means, proportions, variances and correlation co-efficient. Chi-square tests - anova - one-way and two-way.

Unit - 05

Research report : types of reports - contents - styles of reporting - steps in drafting reports - editing the final draft - evaluating the final draft.

ADVANCED CYTOGENETICS

01MBot102

Unit - 01

Dynamics of cell division. Karyotype differentiation and evolution. chromosomal aberrations (numerical and structural) Translocation Inversions. Duplication and deficiencies Their role in chromosome mapping

Unit – 02

Evolutionary role of polyploidy and its uses: Aneuploids Alien chromosomes, gene substitution and addition and their probable role in crop improvement.

Unit – 03

Cytogenetic nature of sex determination.

Unit – 04

Structure and composition of chromatin & chromosomes including the details of the structure of centromere and telomeres.

Unit – 05

Techniques and mechanism of banding in chromosomes.

MICROBIOLOGY AND INDUSTRIAL BIOTECHNOLOGY

01MBot103

Unit – 01

scope and application of microbes in :

- (a) Agriculture with reference to biological nitrogen fixation.
- (b) Food (sources of food and feed)
- (c) Pollution (degradation of pesticides and hydrocarbons in soils).

Unit – 02

Biococnversion of agricultural crop residues and garbage by microbes for the production of alcohol and biogas. Medical microbiology: Laboratory diagnosis of important human diseases antimicrobial drugs and their mechanism of action and drug resistance.

Unit – 03

Immunobiology _preparation of antigens and antisera, characterization of antigen antibody reactions by immunodouble diffusion and general immunoelectrophoretic techniques and western blotting, characterization of antigenic sites by immunoelectron microscopy, strategies for the production of vaccienes and monoclonal antibodies.

Unit – 04

Microbiology of phylloplane and its applications in biological control of airborne insect pests and fungal pathogens. Microbiology of rhizosphere and its importance in controlling soil- borne plant pathogens.General considerations of microbial strain improvement for agriculture, medicine and industry.

Unit – 05

General considerations for biotransformation and production of useful compounds through cell culture, factors affecting yield; immobilized cell systems and bioreactors.. Industrial production of:

- (a) Antibiotics
- (b) Acetic acid

- (c) Lactic acid
- (d) Citric acid
- (e) Common enzymes and
- (f) Microbial insecticides

PLANT CELL, TISSUE AND ORGAN CULTURE

01MBot104

Unit – 01

Techniques of organ, tissue, free cell and protoplast culture. Methods of preparation and sterilization of tissue and culture media. Aspects of nutrition of plant tissue and organ cultures.

Unit – 02

In vitro culture and application of the following:

- Apical meristem
- Flower, fruit
- Anther and pollen, pathways of androgenesis
- Ovary, ovule, nucellus and endosperm
- Embryo and its significance in breeding

Unit – 03

Protoplast culture, somatic hybridization and its application in crop improvement. Totipotency of free angiosperm cell and the significance of free cell culture

Unit – 04

Growth, differentiation and organogenesis in plant tissue and organ culture. Somaclones and induced variations

Unit – 05

Gene delivery systems and role of transgenes in crop improvement. Industrial production of secondary metabolites from callus

SEMESTER II

02MBot101 Advanced Research Methodology

UNIT I

. **Basic concepts:** Research process, problem identification, research designs, informal experimental designs. Completing randomised design, randomized block design, latin square design, factorial designs

UNIT II .

Sampling and testing of hypothesis: Concept of probability, probability distribution, Normal, Poisson, χ -square, t-test. Sampling distribution, central limit theorem, Sandler's A-test, standard error, population mean, population proportion, sample size, confidence intervals, null hypothesis and alternative hypothesis, level of significance, two tailed and one tailed tests, Z-test, t-test, χ^2 -test, F-test, testing of correlation coefficients, ANOVA one way ANOVA, two way ANOVA Tukey's HSD.

UNIT III

. **Non-parametric tests:** Sign test, Fisher-Irwin test, Mc Nemer test, Wilcoxon Mali test, Wilcoxon, Mann-Whitney test, Kruskal-Wallis test, one sample runs test. Spearman's rank correlation, Kendall's coefficient of concordance.

UNIT IV

. **Multivariate analysis:** Multiple regression, multiple discriminant analysis, multiple analysis of variance, canonical correlation analysis, Factor analysis cluster analysis, path analysis. Computational techniques.

UNIT V

Survey of literature: The students will be required to review literature in their respective

disciplines and submit an assignment for evaluation.

References:

1. Kothari, C.R.(2004). Research Methodology: Methods and Techniques, New Age International Publishers, New Delhi.
2. Arya., P.P. and Pal, Y.(2001) Research Methodology in Management: Theory and Case Studies. Deep and Deep Publishers Pvt. Ltd., New Delhi.

02MBOT102 – Plant Hormones (Biosynthesis, Signal Transduction and Action)

UNIT I

Introduction: The plant hormones, their nature, occurrence and function, Regulatory factors in hormone action, level, location and signal transduction.

UNIT II

Hormone biosynthesis, metabolism and its regulation: auxin biosynthesis and metabolism,

Ethylene biosynthesis, Abscisic biosynthesis and metabolism, Brassinosteroid biosynthesis and metabolism, Regulation of gibberellin and brassinosteroid biosynthesis by genetic, environmental and hormonal factors, Polyamine biosynthesis and metabolism.

UNIT III

Hormonal signal transduction: Auxin signal transduction, Gibberellin signal transduction in stem elongation and leaf growth, Cytokinin signal transduction, Ethylene signal transduction in stem elongation, Ethylene signal transduction in flowers and fruits, Abscisic acid signal transduction in stomatal responses, Brassinosteroid signal transduction.

UNIT IV

The functioning of hormones in plant growth and development: Auxin transport, the induction of vascular tissues by auxin, hormones and the regulation of water balance, the role of hormones during seed development and germination, hormonal and daylength control of potato tuberization, the hormonal regulation of senescence, genetic and transgenic approaches to improve crop preferences via hormones

UNIT V

The roles of hormones in defense against insects and diseases: Jasmonates,
Salicylic acid,
Peptide hormones

References:

1. Davies, P.J.. (2004) Plant Hormones :- Biosynthesis, signal transduction, action. Kluwer Academic Publishers. Netherlands.
2. Srivastva, L. M. (2002). Plant Growth & Development. Academic Press, California, USA
3. Buchanan, B.B., Gruissem, W., Jones, R.L. (2002) Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Rockville, Maryland.

02MBOT103 Molecular Toxicology

UNIT I

General concepts in toxicology; Passage of a chemical through the body- absorption, distribution, metabolism, Excretion.

UNIT II

. Role of Phase I metabolism in toxicity: Introduction, Cytochrome P450-mediated Phase I metabolism; Flavin monooxygenase-mediated Phase I metabolism. Role of Phase II metabolism in toxicity: Introduction, Glucuronide conjugation; sulphate conjugation; Glutathione conjugation.

UNIT III

. Co-ordinated responses to toxicity: Introduction, Immediate responses to toxic insult, coordination of the response to reactive chemicals, repair of cellular damage, regulation of apoptosis and necrosis.

UNIT IV

. Role of genetics in toxic response: introduction, mechanisms of genetic control, tools for studying genetic responses to toxic insult.

UNIT V

Technologies for toxicity testing: Genomics-analysis of variation within the genome, Reporter gene assays, Transgenics; Transcriptomics-microarray analysis, real time quantitative RT-PCR; Proteomics- 2D-gel electrophoresis, MALDI-TOF mass spectroscopy, protein chip analysis; Metabonomics; Bioinformatics.

References:

1. Plant, N. (2003). Molecular Toxicology. Bios Scientific Publishers, New York.
2. Hodgson, E. and Smart, R.C. (2001). Introduction to Biochemical Toxicology. John Wiley & Sons, Inc. New York.
3. Keohavong, P. and Grant, S.G. (2005). Molecular toxicology Protocols. Humana Press, New York.
4. Josephy, P.D. and Mannervik, B. (2006). Molecular Toxicology. Oxford University Press.

02MBOT104

DISSERTATION