

# **SAURASHTRA UNIVERSITY**

## **RAJKOT**

**(ACCREDITED GRADE "A" BY NAAC)**



### **FACULTY OF SCIENCE**

Syllabus for

### **M.Phil. (BOTANY)**

Choice Based Credit System

**With Effect From: 2018-19**

**DEPARTMENT OF BIOSCIENCES**  
**SAURASHTRA UNIVERSITY RAJKOT – 360 005**  
**M. Phil Programme in Botany**

Duration: Minimum of 2 Semesters and maximum 4 Semesters

Components of the Programme: (a) M. Phil. Course Work (b) Core & Elective courses and (c) M. Phil. Dissertation

**Details of M. Phil. Syllabus:**

Two (one Core paper in first semester and one Elective paper in second semester).

Credit : Each Course will be of 4 credits in 4 h/week/Sem. 08 Credits  
 Dissertation: 16 hours/week/Sem. For 2 Sems. 16 Credits

-----  
**Total 24 Credits**

Marks : Each course is of 100 marks 200 Marks  
 Dissertation 200 marks (100 thesis & 100 Viva) 200 Marks

-----  
**Total 400 Marks**

**M. Phil. Programme Structure**

As per Ministry of Human Resource Development, UGC New Delhi, Notification 5th May, 2016, (Minimum Standards and Procedure for award of M.Phil. / Ph.D. Degrees) Regulation – 2016, (SU Ordinance Circular No. PGTR/PhD/1/254/2017, dated 25-1-2017)

**CHOICE BASED CREDIT SYSTEM (CBCS)**  
 (Total 24 Credits)

COURSE	PAPER NAME	HOURS / WEEK	CREDIT	MARKS
<b>SEMESTER - I</b>				
<b>Coursework</b>	<b>M.Phil. Botany Course Work (Research Methodology)</b>	8	8	
M.Phil.Bot-101	<b>Paper – 1</b> General Botany (Core)	4	4	100
M.Phil.Bot-205	Dissertation – I*	-----	8	
<b>SEMESTER TOTAL</b>			12	100
<b>SEMESTER - II</b>				
	<b>Paper – 2</b> (Elective) Any ONE	4	4	100
M.Phil.Bot-202	Desert Ecology			
M.Phil.Bot-203	Advances in Plant Biology			

M.Phil.Bot-204	Herbal Medicine			
M.Phil.Bot-205	Dissertation – II*	16	8	200
<b>SEMESTER TOTAL</b>		<b>20</b>	<b>12</b>	<b>300</b>
<b>GRAND TOTAL</b>		<b>40</b>	<b>24</b>	<b>400</b>

\*Dissertation will commence in the beginning of the first Semester but will be evaluated and grade points will be given in the Final Semester.

## **Programme Outcomes of M. Phil. Botany**

### **PO - 1 : Critical Thinking**

M. Phil Botany is a link between M Sc and PhD. degree. The students are encouraged to go for M.Phil degree, to develop significant thinking and analytical ability for research criteria and future studies and jobs. It develops knowledge of students in plant sciences and theoretical skills with interactions and explanations.

### **PO - 2 : Social Interaction**

The program helps in development of interest in planning and implementation of research in cooperative manner. The M.Phil degree in Botany divinely enhances the analytical skill of the students and harbor great confidence in them.

### **PO – 3 : Core academic skills**

Exposure in M.Phil prides deeper undertaking of the subject and in fact students get more exposure and develop confidence in conceptualization of the research theme and deciding the topic, designing of the experiments, analyzing the data and deriving outcome from it.

### **PO-4 :Research and Development**

Students develop skills to handle biochemical and molecular techniques to plan and carry out experiments. The programme will enable them to develop skills in analyzing data, testing of hypotheses using statistical software's and draw conclusions from the experimental data.

### **PO-5 :Communication Skills**

Students gain confidence in delivering seminars, as teaching in M.Phil is largely interactive that includes, class room teaching, seminar delivering by the students, writing a concept note and assignment on the recent topics and developments in the field. They are able to communicate effectively with scientific community and with Society at large. Comprehend.

### **PO – 6 : Continuous Learning**

Recognize and integrate life long learning skills to become proactive in personal and professional live. The students develop interest in persuading higher studies.

## **Programme Specific Outcomes of M. Phil. Botany**



**PSO-1:**

M.Phil Botany is a research based course to develop knowledge on practical application of plant sciences. It is beneficial to students to develop skills in plant identification, plant physiology, plant biochemistry, plant propagation (micro and macro), plant conservation, plant breeding and plant genetics.

**PSO-2:**

Identification of the flora at morphological, anatomical and molecular level in field and laboratory at practical level.

**PSO -3:**

Studies on changes in floral biodiversity with respect to changes in location, habitat, season and climate. Influence of habitat, land and forest destruction on floral diversity. Conservation of rare and endangered species. To develop understanding on conservation of essential plant species at regional, state, national and international level.

**PSO -4:**

Judicial use of plant resources, conservation of wild and economically important plant species available in specific regions of the world. Research on ethanobotanical uses of plant species and its use as herbal drugs. Development of pharmaceutical and biotechnological products from plant species.

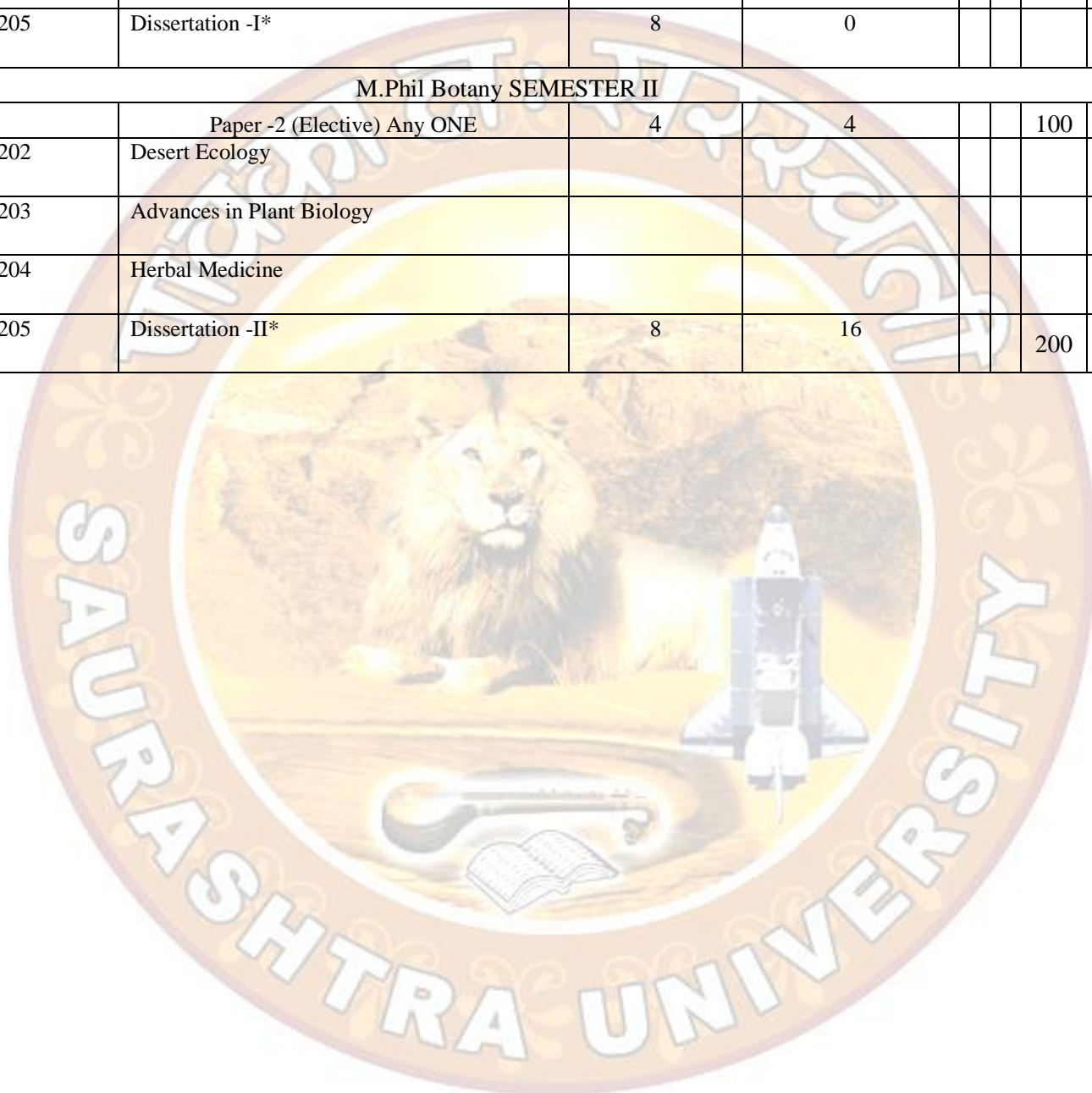
**PSO -5:**

To get hands on training on plant propagation techniques such as plant tissue culture, grafting, layering, cutting and budding. To develop better techniques through research for multiplication of economically important plant species at agriculture sector.

**PSO -6:**

To develop research criteria on plant breeding and genetics for development of high fruits yielding plant species, development of drought resistant plants, development of salinity resistant plants, development of disease resistant plants and conservation of germplasm of economically important plant species

M.Phil Botany SEMESTER I							
Coursework	M.Phil Botany Course Work (Research Methodology)	8	8				
M.Phil. Bot-101	Paper-1 General Botany (Core)	4	4			100	2.5
M.Phil. Bot-205	Dissertation -I*	8	0				
M.Phil Botany SEMESTER II							
	Paper -2 (Elective) Any ONE	4	4			100	2.5
M.Phil. Bot-202	Desert Ecology						
M.Phil. Bot-203	Advances in Plant Biology						
M.Phil. Bot-204	Herbal Medicine						
M.Phil. Bot-205	Dissertation -II*	8	16			200	



## SEMESTER – I

### M.Phil. Course Work: 8 Credits

#### Objectives:

The objective is to provide hand on training in methodology and tools used in research and understating basics of research design, data analysis and drawing conclusions

#### **Course Outcome:**

In the first semester, according to the UGC Ordinance 2016, they have to complete a 8-Credit Course work.

**CO 1:** It focuses on the research mythology, data analysis, statistical methods, literature survey, presentations and computer applications.

**CO 2:** By studying this paper students will be able to understand research terms, the research process and develop skills and ethics associated with the research process.

**CO 3:** Students will learn statistical tools and software for data analysis.

#### **REFERENCES:**

1. Research methods and Statistics A Critical Thinking by Sherri L. Jackson
2. Plant Propagation - M K. Sadhu
3. Molecular Biotechnology Principles and Practices - Channarayappa
4. Biochemistry and Molecular Biology of Plants - Bob B, Wilhelm G and Russell J
5. Methods in Biostatistics for Medical Students and Research Workers by B . K. MahajanJaypee
6. Biostatistics by SundarRao
7. Statistics by D. C. Sancheti

In this semester they also study one core paper of 4 Credit. In the beginning of this semester, the students also decide the topic of their dissertation and stat working on it, which continue till second semester.



## **M.Phil Paper – 1. General Botany (Core)**

### **Course Outcome:**

CO 1: Students will get exposure on the plant taxonomy

CO 2: Students will gain knowledge on plant physiological processes significant for plant growth and development

CO 3: Different aspects on plant propagation, genetics and molecular biology can be known.

### **Unit – 1. Plant Ecology – I**

1.1 Biological diversity, Nature of community, Community change, Community metabolism, Primary production, Habitat and niche

1.2 Quantification of plant biodiversity, 'k' and 'r' selection

1.3 Species interaction and keystone species, Extinction, rare and endangered species

1.4 Nutrient cycles

### **Unit – 2 Plant Physiology – I**

2.1 Growth and development: Patterns of growth development, growth kinetics and growth indices.

2.2 Photomorphogenesis and plant development: Phytochrome forms and their functions.

2.3 Photoperiodism and physiology of flowering: Long day plants, short day plants, induction cycle, florigen concept.

2.4 Water relation to plants: The components of water potential, units of water potential and their measurements.

2.5 Mineral nutrition: Trace and tracer elements, nutrient deficiency symptoms and some function of essential elements.

### **Unit – 3 Plant Physiology – II**

3.1 Energy input in plants: Principles of light absorption by plants, Emerson enhancement effect.

3.2 CO<sub>2</sub> fixation: C<sub>3</sub>, C<sub>4</sub> and CAM pathways for CO<sub>2</sub> fixation.

3.3 Photosystems: Distribution of light energy between PS I and PS II.

3.4 Hormones and growth regulators: Types of hormones and their influence on growth and development.

3.5 Agricultural applications of plant growth hormones.

### **Unit – 4 Plant Technology**

4.1 Selection criteria for explants.

4.2 Selection criteria for culture media.

4.3 Basic tissue culture techniques.

4.4 Applications of tissue culture in Horticulture.

4.5 Transgenic plants and their role in agriculture.

## Semester – II

### Course -2 (Elective: any ONE of the following)

**In the second semester**, the students select one elective paper out of three options. These papers are designed on the basis of three different domains of the discipline and include recent directions and development.

#### **Micro-202: Desert Ecology**

##### **Course Outcome:**

CO 1: In this paper, the students are acquainted with the soil science and growth of plants in different habitats.

CO 2: Different aspects of soil properties and its influence on growth of plants are studied. The students gain broader spectrum on the abilities of plants to grow in stress environments.

CO 3: Another part of the syllabus relates to the increase in desert areas due to soil erosion, degradation of land, destruction of forests etc. Students develop awareness regarding the problems and develop insight on solving it.

CO 4: Since these problems are major in arid, semi-arid and desert regions, research is carried out and stress resistant plants are developed, their study becomes very interesting and significant.

##### **Unit:1 Plant communities**

- 1.1 Concept of community and continuum, Community metabolism: primary production
- 1.2 Factors limiting primary productivity, Community change, Biogeochemical cycle
- 1.3 Population growth, carrying capacity, population regulation
- 1.4 Species interactions, ecological niche, ecotypes

##### **Unit: 2 Desertification**

- 2.1 Causes of desertification
- 2.2 Changes in vegetation and biomass
- 2.3 Changes in physical and chemical properties of soil
- 2.4 Measures to combat desertification
- 2.5 Adaptations of plants to arid conditions

##### **Unit: 3 Saline soil**

- 3.1 Nature and properties of salt affected soils
- 3.2 Plants in relation to salinity
- 3.3 Mangroves
- 3.4 Mechanisms of salt injury in plants
- 3.5 Salinity and metabolic processes

##### **Unit: 4 Mechanisms**

- 4.1 Intra – and inter cellular compartmentation of ions
- 4.2 Mechanisms of salt resistance
- 4.3 Sodium-calcium interactions under salinity stress
- 4.4 Salinity and plant mineral nutrition
- 1.5 Strategies for increasing salt resistance



## **BOT-203: Advances in Plant Biology**

### **Course Outcome:**

CO1: In this paper, Students gain knowledge on plant growth physiology, genetics and molecular biology

CO2: Students get hands on training on plant propagation techniques which is helpful to get jobs and develop business in agriculture and horticulture sector

CO3: Students get hands on training on plant molecular biology and genetics which helps in getting jobs at teaching and research institutes

### **Unit: 1 Plant Growth and Development**

1.1 Phytohormones auxins, GA, KiN, ABA and Ethylene. Their structure and derivatives in Plants.

1.2 Methods of estimation of these hormones.

1.3 Physiological roles of auxins, GA, KiN, ABA and Ethylene.

1.4 Other Growth regulating substances like polyamines, brassinosteooids, Jasminoids etc.

### **Unit: 2 Plant Propagation techniques**

2.1. Choice of techniques

2.2. Hydroponics

2.3. Bonsai

2.4. Horticulture and floriculture

### **Unit: 3 Molecular marker techniques in Plants**

3.1. Importance of molecular marker techniques

3.2. Various techniques like RAPD, AFLP, SNP etc.

3.3. Advantages and limitations of these techniques

### **Unit: 4. Plant tissue Culture Techniques**

4.1. Plant Material Selection

4.2. Culture Medium Selection, Preparation and Manipulation

4.3. Callus Induction and Subculturing

4.4. Protoplast Isolation, Culture and Selection of Hybrids

4.5. Production of Secondary Metabolites

## **BOT-203: Herbal Medicine**

### **Course Outcome:**

CO1: In this paper, Students gain knowledge on ethanobotanical use of plant resources

CO2: Students get hands on training on development of herbal drugs which is helpful to get jobs and develop business in pharmaceutical and biotechnological sector

CO3: Students get hands on training on drugs development which helps in getting jobs at teaching and research institutes

### **Unit 1 Nutraceuticals**

- 1.1 General Introduction: An overview
- 1.2 Classification of nutraceuticals
- 1.3 Herbs as functional foods
- 1.4 Effectiveness and safety
- 1.5 Nutraceuticals as antioxidants

## **Unit 2 Extraction, Isolation and Analysis of Phytoconstituents**

- 2.1 Principles of extraction and selection of suitable extraction method.
- 2.2 Different methods of extraction infusion, decoction, digestion, maceration, percolation
- 2.3 Soxhlet extraction, cold percolation extraction, supercritical fluid extraction
- 2.4 Isolations methods of important phytoconstituents
- 2.5 Identification of phytoconstituents

## **Unit 3 Herbal remedies- Toxicity and Regulations**

- 3.1 Importance of Herbal therapies; Prospects of herbal research
- 3.2 Efficacy of herbal medicinal products
- 3.3 Safety in herbal drugs; Herbal drug regulations in India
- 3.4 General concepts of evaluation and quality control
- 3.5 Guidelines for toxicity investigation of herbal medicines

## **Unit 4 Traditional Medicine and Intellectual property rights**

- 4.1 Traditional medicinal plants and its market
- 4.2 Traditional Medicine and Intellectual Property Rights
- 4.3 Patent protection for herbal medicine
- 4.4 Convention on Biological Diversity (CBD) and IPR
- 4.5 Role of Ethnobotany and ethnobotanist

### **References:**

Recent research papers from the journals and review articles

### **DISSERTATION PROJECT WORK**

Dissertation research work is offered in Semester I and II, in which students carry out experiments on the determined project frame under the supervision of the guide. Dissertation commences in the beginning of the first Semester and continues in the second semester.