



Hindi Vidya Prachar Samiti's
Ramniranjan Jhunjhunwala College
of Arts, Science & Commerce
(Autonomous College)

Affiliated to
UNIVERSITY OF MUMBAI

Syllabus for the M.Sc.

Program: M.Sc. BOTANY

Program Code: RJSPGBOT

(CBCS 2019-2020)

M.Sc. Semester I Botany Syllabus**SEMESTER I**

Course Code	UNIT	TOPIC HEADINGS	Credits	L / Week
RJSPGBOT101	Paper Title: Plant Diversity: Cryptogams I (Algae and Fungi)			
	I	Algae	4	1
	II	Applied Phycology		1
	III	Fungi		1
	IV	Applied mycology		1

RJSPGBOT102	Paper Title: Plant Diversity – Spermatophyta I (Gymnosperms and Angiosperms)			
	I	Gymnosperms	4	1
	II	Origin of Angiosperms		1
	III	Angiosperms I		1
	IV	Angiosperms II		1

RJSPGBOT103	Paper Title: Plant Physiology			
	I	Lipid metabolism	4	1
	II	Carbohydrate metabolism		1
	III	Seed Physiology		1
	IV	Plant hormones		1

RJSPGBOT104	Paper Title: Cytogenetics, Molecular Biology and biotechnology			
	I	Cytogenetics	4	1
	II	Molecular Biology		1
	III	Recombinant DNA technology		1
	IV	Applications of R-DNA technology		1

RJSPGBOTP101	Plant Diversity :Cryptogams I (Algae and Fungi)		2	4
RJSPGBOTP102	Plant Diversity – Spermatophyta I (Gymnosperms and Angiosperms)		2	4
RJSPGBOTP103	Plant Physiology		2	4
RJSPGBOTP104	Cytogenetics, Molecular Biology &Biotechnology		2	4

Theory semester I

Course Code	Title	Credits
RJSPGBOT101	Plant Diversity-Cryptogams I (Algae and Fungi)	4
<u>Unit I: Algae</u>		1
<ul style="list-style-type: none"> • Classification of Algae up to orders, according to the system proposed by G.M Smith. Cyanophyta, Chlorophyta, Euglenophyta, Pyrrophyta, Chrysophyta, Phaeophyta and Rhodophyta. 		
<u>Unit II: Applied Phycology</u>		1
<ul style="list-style-type: none"> • Techniques of culturing Algae. ➤ Algae as biofuel. ➤ Algae as single cell protein. ➤ Sea weeds for food and industrial applications ➤ Algae to combat climate change 		
<u>Unit : III Fungi</u>		1
<ul style="list-style-type: none"> • Classification of fungi, upto orders, according to the system proposed by Alexopoulos. • General account of spore bearing organs and their arrangements in various groups of fungi; spore release and dispersal. • Mycorrhiza: Type, distribution and significance with reference to agriculture and forestry. 		
<u>Unit : IV Plant Pathology</u>		1
<ul style="list-style-type: none"> • Disease cycle and environmental relation: prevention and control of plant diseases and role of quarantine. • Study of the following diseases with reference to symptoms, causal organism and disease cycle : <ul style="list-style-type: none"> a. Damping off of seedling disease b. Ergot of grains and grasses • Bacterial diseases: Overview, Crown gall disease • Viral diseases: Overview, Cauliflower mosaic virus • Diseases due to insects : Overview, Disease due to <i>Helicoverpa</i> • Diseases due to nematodes: Overview, Root knot of sugarcane 		

M.Sc. Semester I Botany Syllabus

M.Sc	Semester I Theory
<p>RJSPGBOT101</p> <p>Paper I</p> <p>Plant Diversity- Cryptogams I (Algae and Fungi)</p>	<p>Course Outcomes 1.1 :</p> <ol style="list-style-type: none"> 1. Basis of classification, chloroplast type, reserve food, reproduction Cyanophyta, Chlorophyta, Euglenophyta, Pyrrophyta, Chrysophyta, Phaeophyta and Rhodophyta. 2. Techniques of culturing Algae for commercial products. Recent concerns on climate change and how algae can help in combating climate change. 3. Basis of classification, of fungi mycelium, hyphae, spores, types of reproduction up to orders and study of spore bearing organs and their arrangements in various groups of fungi; spore release and dispersal. 4. Study of Mycorrhiza - Type, distribution and significance with reference to agriculture and forestry. 5. Detailed study of diseases caused by Plant pathogens with symptoms, causal organism and disease cycle. <p>Learning outcomes :</p> <ul style="list-style-type: none"> ➤ Understanding the classical botany, diversity of lower plants and application of algae for commercial products ➤ Learning the techniques of culturing Algae, biofuel production entrepreneurship ➤ Application of fungal mycorrhiza agricultural applications ➤ Knowing the cause of plant diseases agricultural applications

M.Sc. Semester I Botany Syllabus

Course Code	Title	Credits
RJSPGBOT102	Plant Diversity- Spermatophyta I (Gymnosperms and Angiosperms)	4
Unit I: Gymnosperms I <ul style="list-style-type: none"> • Classification of gymnosperms upto orders according to the system proposed by C. J. Chamberlain. • General characters; affinities and interrelationships of Cycadofilicales, Bennettitales and Cordaitales 		1
<u>Unit II: Origin of Angiosperms</u> Origin and evolution of angiosperms; the primitive Angiospermic flower; primitive and advanced characters in angiosperms.		1
<u>Unit : III Angiosperms I</u> <ul style="list-style-type: none"> • International Code of Botanical Nomenclature (I.C.B.N.) History and basic Principles. • Concept of characters: - Introduction, type function values of taxonomic characters- numerical taxonomy, chemotaxonomy, Molecular systematics. 		1
<u>Unit : IV Angiosperms II</u> <ul style="list-style-type: none"> • Evolution, variation and speciation, Biosystematic categories, Biotypes and Ecotypes. • Study of Plant families: Ranunculaceae, Annonaceae, Magnoliaceae, Anacardiaceae, Sapindaceae, Lythraceae, Leguminosae, Convolvulaceae, Apocyanaceae, Boraginaceae, Verbenaceae, Bignoniaceae, Chenopodiaceae, Liliaceae, Orchidaceae 		1

M.Sc	Semester I Theory
<p>RJSPGBOT102</p> <p>Paper II</p> <p>Plant diversity - Spermatophyta I</p>	<p>Course Outcomes 1.2 :</p> <ol style="list-style-type: none"> 1. C. J. Chamberlain classification of gymnosperms upto orders 2. General characters; affinities and interrelationships of Cycadofilicales, Bennettitales and Cordaitales. 3. Origin and evolution of angiosperms; the primitive Angiospermic flower; primitive and advanced character in angiosperms. 4. Study of ICBN basic principles for assessment of relationships, delimitation of taxa. 5. Study of evolution, variation and speciation, biosystematics categories, biotypes, ecotypes and concept of characters for other taxonomic parameters. <p>Learning outcomes :</p> <ul style="list-style-type: none"> ➤ Understanding the diversity and characters of gymnosperms ➤ Learning of the evolution of Angiospermic characters ➤ Understanding International Code of Botanical Nomenclature (I.C.B.N.) and hierarchy of rank in plants ➤ Field identification of plants

M.Sc. Semester I Botany Syllabus

Course Code	Title	Credits
RJSPGBOT103	Plant Physiology	4
<u>Unit I: Lipid Metabolism</u> <ul style="list-style-type: none">• Lipids- an overview• Fatty acid synthesis – even Carbon• Synthesis of membrane lipids• Beta oxidation of even carbon chain		1
<u>Unit II: Carbohydrate metabolism</u> Biosynthesis, biodegradation and regulation of <ul style="list-style-type: none">• Sucrose• Starch• Cellulose		1
<u>Unit : Seed Physiology</u> <ul style="list-style-type: none">• Metabolism of food reserves – Carbohydrates, Proteins and Lipids• Growth factors in germination• Dormancy – Control and release		1
<u>Unit : IV Plant Hormones</u> <ul style="list-style-type: none">• Plant hormones: Biosynthesis, storage, breakdown and transport of Auxins, Gibberellins, Cytokinins, Ethylene and ABA.		1

M.Sc. Semester I Botany Syllabus

M.Sc	Semester I Theory
RJSPGBOT103	Course Outcomes 1.3 :
Paper-III	1. Biosynthesis and break down of lipids and carbohydrates
Plant	2. Detailed study of proteins and plant growth hormones
Physiology	Learning outcomes : <ul style="list-style-type: none">➤ Understanding the biosynthetic pathways of primary metabolites and also how they are broken down and the enzymes involved in these processes➤ Learning the native and modified form of proteins and its application➤ Application of plant growth regulators in plant morphogenesis, plant tissue culture and propagation of plants.

M.Sc. Semester I Botany Syllabus

Course Code	Title	Credits
RJSPGBOT104	Cytogenetics, Molecular Biology and Biotechnology	4
Unit I: Cytogenetics <ul style="list-style-type: none">Cell division and cell cycle: Steps in cell cycle and control of cell cycle.		1
Unit II: Molecular Biology <ul style="list-style-type: none">Microbial Genetics: Molecular basis of transformation, transduction, Conjugation; fine structure of the gene, T4 Phage, complementation analysis, deletion mapping, cis-trans tests.		1
Unit : III Recombinant DNA Technology <ul style="list-style-type: none">Vectors in gene cloning: pUC19, phage, cosmid, BAC and YAC vectors. High and low copy number plasmids and its regulation.		1
Unit : IV Applications of Recombinant DNA technology <ul style="list-style-type: none">Application of recombinant DNA technology for production of herbicide resistant plants, insect resistant plants, improving seed storage proteins and golden rice.		1

M.Sc. Semester I Botany Syllabus

M.Sc	Semester I theory
RJSPGBOT104	Course outcomes 1.4 :
Paper-IV	1. Detailed study of Cell division and cell cycle
Cytogenetics,	2. Exploring microbial genetics with the study of molecular basis of
Molecular	transformation, transduction, conjugation; fine structure of the
Biology and	gene, T4 Phage, complementation analysis, deletion mapping,
Biotechnology	cis-trans tests. Understanding c-DNA libraries, restriction
	enzyme, analysis of cloned DNA sequences and southern
	hybridization.
	3. Detailed study of Recombinant DNA Technology of Vectors in
	gene cloning and production of herbicide resistant plants, insect
	resistant plants, improving seed storage proteins and golden rice.
	Learning outcome :
	➤ Understanding the steps of cell division and cell cycle. Abnormal
	cell division.
	➤ Understanding detailed concept of molecular Genetics and
	Recombinant DNA Technology
	➤ Applications of Recombinant DNA technology

M.Sc. Semester I Botany Syllabus

Course Code	Practical Title	Credits
RJSPGBOTP101	Plant Diversity-Cryptogams I (Algae and Fungi)	2
<p>1. Study of following types with reference to their systematic position, thallus and reproductive structures: <i>Scytonema</i>, <i>Lyngbya</i>, <i>Anabaena</i>, <i>Oscillatoria</i>, <i>Volvox</i>, <i>Pandorina</i>, <i>Ulothrix</i>, <i>Zygnema</i>, <i>Cladophora</i>, <i>Pithophora</i>, <i>Closterium</i>, <i>Chara</i>, <i>Nitella</i>, <i>Dictyota</i>, <i>Padina</i>, <i>Batrochospermum</i>, <i>Gracilaria</i></p> <p>2. Preparation of algal herbaria.</p> <p>3. Study of the following types with reference to their systematic position, thallus and reproductive structures: <i>Saprolegnia</i>, <i>Phytophthora</i>, <i>Penicillium</i>, <i>Peziza</i>, <i>Claviceps</i>, <i>Lycoperdon</i>, <i>Ustilago</i>, <i>Fusarium</i> and <i>Trichoderma</i>.</p> <p>4. Study of the disease mentioned in the syllabus (theory) with reference to the symptoms. Causal organisms and disease cycle.</p>		

M.Sc	Semester I Practical : Experiential learning, algae and fungi from different habitats
RJSPGBOTP101 Practical I Plant Diversity- Cryptogams I (Algae and Fungi)	<p>Course Outcome:</p> <ol style="list-style-type: none"> Detailed study of type of algae and fungi systematic position, thallus and reproductive structures Brief Study of the disease symptoms, causal organisms and disease cycle. <p>Learning outcomes :</p> <ul style="list-style-type: none"> ➤ Understanding the diversity of classical botany and its future application for commercial aspects ➤ Detailed study of causative agent of plant diseases.

Course Code	Practical Title	Credits
RJSPGBOTP102	Plant Diversity- Spermatophyta I (Gymnosperms and Angiosperms)	2
<p>1. Gymnosperms: A study of following types - <i>Cordaites</i> (Fossil) <i>Araucaria</i>, <i>Cupressus</i>, <i>Podocarpus</i>.</p> <p>2. Angiosperms: Study of plant families as prescribed in theory</p> <p>3. Identification of genus and species with the help of flora volumes. (In addition to the above mentioned families, all families studied in undergraduate classes are included).</p>		

M.Sc	Semester I Practical
RJSPGBOTP102	Course Outcomes: Field studies, habitat diversity, Skill development
Practical II Plant diversity - Spermatophyta I (Gymnosperms and Angiosperms)	<p>1. Detailed study of gymnosperms and angiosperms families with their morphological peculiarities and economic importance</p> <p>2. Identifying the genus and species of a plant with the help of Cooke's Flora.</p> <p>Learning outcomes :</p> <ul style="list-style-type: none"> ➤ Understanding the past environment with diversity of gymnosperms ➤ Learning of comprehensive angiosperms taxonomy with the help morphological and its economic importance ➤ Comparative study of the genus and species of a plant with learning the diversity in morphological peculiarities.

M.Sc. Semester I Botany Syllabus

Course Code	Practical Title	Credits
RJSPGBOTP103	Plant Physiology	2
<ol style="list-style-type: none"> 1. Enzyme kinetics : Determination of K_m and V_{max} of the enzyme amylase (purified amylase) 2. Estimation of Lipase from germinating ground nut seeds 3. Separation of fatty acids by TLC 4. Estimation of fatty acids from different oil. 5. Estimation of Sucrose synthase activity from suitable plant material 6. Estimation of total proteins from germinating seeds at different stages (students must prepare standard graph for protein) 7. Estimation of alpha amino acids from germinating seeds at different stages of germination (students must prepare standard graph for leucine) 8. Experiment on PGR 		

M.Sc	Semester I Practical Experiential learning, experimental design, data analysis, interpretation.
RJSPGBOTP103 Practical III Plant Physiology	<p>Course Outcomes:</p> <p>Learning outcomes :</p> <ul style="list-style-type: none"> ➤ Understanding the K_m and V_{max} and activity of the enzymes ➤ Understanding the chromatography technique and its application ➤ Understanding the absorption spectrum and colour filters ➤ Understanding the influence of PGR's on plant growth.

M.Sc. Semester I Botany Syllabus

Course Code	Practical Title	Credits
RJSPGSBOTSPI04	Cytogenetics, Molecular Biology and Biotechnology	2
<ol style="list-style-type: none"> 1. Preparation of cytological stains, fixatives and pretreatment agents. 2. Squash preparation from pre-treated root tips of different plant material (colchicine/ Para dichlorobenzene/ Aesculin. 3. Smear preparation from any suitable plant material. 4. Giant chromosomes: <i>Chironomous</i> larva 5. Genetic transformation of plant material using wild type <i>Agrobacterium rhizogenes</i>/ <i>Agrobacterium tumefaciens</i>. 		

M.Sc	Semester I Practical
RJSPGBOTP104 Practical IV Current trends in plant science- II	Course Outcome: <ol style="list-style-type: none"> 1. Study of preparation of cytological stains, fixatives and pre-treatment agents. 2. Pretreatment techniques. Arrested metaphase squash preparation using different plant materials. Learning outcomes : <ul style="list-style-type: none"> ➤ Student will be able to prepare stains and fixatives ➤ They will be able to process material for observation of chromosomes.

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