



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 2020-2021)

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
RJSPGBOTP102	Plant Diversity – Spermatophyta I (Gymnosperms and Angiosperms)			2
RJSPGBOTP103	Plant Physiology			2
RJSPGBOTP104	Cytogenetics, Molecular Biology &Biotechnology			2

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 bio fuel, Algae as single cell protein. Solid waste management by fungi and treatment of industrial effluents – dyes by laccases and peroxidases ➤ Biomass for energy: Sources of biomass, advantages &disadvantages, uses of biomass. ➤ Biogas production from food processing waste: vegetable canning waste, flour, molasses etc. ➤ Ethanol from biomass and Lignocellulosic residue. 		
<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. 		
<u>Unit: IV Applied Mycology</u>		1
<ul style="list-style-type: none"> ➤ Mycorrhiza: Type, distribution and significance with reference to agriculture and forestry. ➤ Study of the following diseases with reference to symptoms, causal organism and disease cycle: <ol style="list-style-type: none"> a. Late blight of potato b. Covered smut of jowar 		

M.Sc	Semester I Theory
RJSPGBOT101	Course Outcomes1.1:
Paper I	1. Basis of classification, chloroplast type, reserve food, reproduction Cyanophyta, Chlorophyta, Euglenophyta, Pyrrophyta, Chrysophyta, Phaeophyta and Rhodophyta.
Plant	2. Techniques of culturing Algae for commercial products
Diversity-	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.
Cryptogams I	4. Study of Mycorrhiza - Type, distribution and significance with reference to agriculture and forestry.
(Algae and Fungi)	5. Detailed study of diseases caused by Plant pathogens with symptoms, causal organism and disease cycle.
	Learning outcomes:
	➤ 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 ➤ 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 character in angiosperms.		1
<u>Unit : III Angiosperms I</u> ➤ 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> ➤ Evolution, variation and speciation, Biosystematics 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 Botany Syllabus

M.Sc	Semester I Theory
RJSPGBOT102 Paper II Plant diversity - Spermatophyta I	<p>Course Outcomes1.2:</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> <ul style="list-style-type: none">➤ Biosynthesis, biodegradation and regulation of<ol style="list-style-type: none">1. Sucrose2. Starch3. 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 Theory
RJSPGBOT103 Paper-III Plant Physiology	<p>Course Outcomes1.3:</p> <ol style="list-style-type: none"> 1. Detailed study of regulation of photosynthesis pathways (C_3, C_4 CAM and Pentose Phosphate Pathway) 2. Role of light in the activation of dark phase enzymes, regulation of enzymes. 3. Photosynthesis in prokaryotes (Bacteria and Cyanobacteria) 4. Detailed study of proteins and plant growth hormones <p>Learning outcomes:</p> <ul style="list-style-type: none"> ➤ Understanding the regulation and importance enzymes and sunlight in photosynthesis of eukaryotes and prokaryotes. Correlation with productivity ➤ Learning the native and modified form of proteins and its application ➤ Application of plant growths regulators in plant morphogenesis, plant tissue culture and propagation of plants.

Course Code	Title	Credits
RJSPGBOT104	Cytogenetics, Molecular Biology and Biotechnology	4
<u>Unit I: Cytogenetics</u> ➤ Cell division and cell cycle: Steps in cell cycle and control of cell cycle.		1
<u>Unit II: Molecular Biology</u> ➤ Microbial Genetics: Molecular basis of transformation, transduction, Conjugation; fine structure of the gene, T4 Phage, complementation analysis, deletion mapping, cis-trans tests.		1
<u>Unit: III Recombinant DNA Technology</u> ➤ Vectors in gene cloning: pUC19, phage, cosmid, BAC and YAC vectors. High and low copy number plasmids and its regulation.		1
<u>Unit: IV Applications of Recombinant DNA technology</u> ➤ 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 Paper-IV Cytogenetics, Molecular Biology and Biotechnology	<p>Course outcomes1.4:</p> <ol style="list-style-type: none">1. Detailed study of Cell division and cell cycle2. Exploring microbial genetics with the study of molecular basis of transformation, transduction, conjugation; fine structure of the gene, T4 Phage, complementation analysis, deletion mapping, cis-trans tests. Understanding cDNA 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. <p>Learning outcome:</p> <ul style="list-style-type: none">➤ 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
<ol style="list-style-type: none"> Study of following type with reference to their systematic position, thallus and reproductive structures: <i>Scytonema, Lyngbya, Anabaena, Oscillatoria, Volvox, Pandorina, Ulothrix, Zygnema, Cladophora, Pithophora, Closterium, Chara, Nitella, Dictyota, Padina, Batrachospermum, Gracilaria</i> Preparation of algal herbaria. Study of the following type with reference to their systematic position, thallus and reproductive structures: <i>Saprolegnia, Phytophthora, Penicillium, Peziza, Claviceps, Lycoperdon, Ustilago, Fusarium and Trichoderma</i>. Study of the disease mentioned in the syllabus (theory) with reference to the symptoms. Causal organisms and disease cycle. 		

M.Sc	Semester I Practical: Experiential learning, algae and fungi from different habitats
RJSPGBOTP101 Practical I Plant Diversity- Cryptogams I (Algae and Fungi)	Course Outcome: <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. Learning outcomes: <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.

M.Sc. Semester I Botany Syllabus

Course Code	Practical Title	Credits
RJSPGBOTP102	Plant Diversity- Spermatophyta I (Gymnosperms and Angiosperms)	2
1. Gymnosperms: A study of following types - <i>Cordaitea</i> (Fossil), <i>Araucaria</i> , <i>Cupressus</i> , <i>Podocarpus</i> . 2. Angiosperms: Study of plant families as prescribed in theory 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).		

M.Sc	Semester I Practical
RJSPGBOTP102 Practical II Plant diversity - Spermatophyta I (Gymnosperms and Angiosperms)	Course Outcomes: Field studies, habitat diversity, Skill development 1. Detailed study of gymnosperms and angiosperms families with their morphological peculiarities and economic importance 2. Identifying the genus and species of a plant with the help of Cooke's Flora. Learning outcomes: ➤ 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

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 total proteins from germinating seeds at different stages (students must prepare standard graph for protein) 6. Estimation of alpha amino acids from germinating seeds at different stages of germination (students must prepare standard graph for leucine) 7. Experiment using PGR 		

M.Sc	Semester I Practical Experiential learning, experimental design, data analysis, interpretation.
RJSPGBOTP103 Practical III Plant Physiology	Course Outcomes: <ol style="list-style-type: none"> 1. Detailed study of enzymes and its mechanism 2. Chromatography application for fatty separation. 3. Detailed study of seed germination and its physiology. Learning outcomes: <ul style="list-style-type: none"> ➤ Understanding the K_m and V_{max} and activity of the enzymes ➤ Assessment of titratable acid number, GOT and GPT in plant ➤ Understanding the chromatography technique and its application ➤ Understanding the absorption spectrum and colour filters

M.Sc. Semester I Botany Syllabus

Course Code	Practical Title	Credits
RJSPGSBOTSPI04	Cytogenetics, Molecular Biology and Biotechnology	2
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		

M.Sc	Semester I Practical
RJSPGBOTP104 Practical IV Current trends in plant science- II	Course Outcome: 1. Study of preparation of cytological stains, fixatives and pre-treatment agents. 2. Pre-treatment techniques. Arrested metaphase squash preparation using different plant materials. Learning outcomes: ➤ Student will be able to prepare stains and fixatives ➤ They will be able to process material for observation of chromosomes.

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Scheme of Examinations

1. Internal Examination 40 marks various modes with different weightage (Presentation, seminar, mcq, quiz etc.)
2. One External (Semester End Examination) of 60 marks. Duration 2 ½ hours.
3. One Practical at the end of Semester consisting of Practical I 50 marks, Practical II 50 marks, Practical III 50 marks and Practical IV 50 marks separate passing in each practical
4. Minimum marks for passing Semester End Theory and Practical Exam is 40 %. Separate passing for Internal and Semester End examination.
5. For any KT examinations, there shall be ODD-ODD/EVEN-EVEN pattern followed.
6. Two short field excursions for habitat studies are compulsory. Field report submission is mandatory
7. Field work of not less than eight hours duration is equivalent to one period per week for a batch of 15 students.
8. A candidate will be allowed to appear for the practical examinations if he/she submits a certified journal of Botany or a certificate from the Head of the department / Institute to the effect that the candidate has completed the practical course of M Sc Semester I Botany as per the minimum requirements.
9. In case of loss of journal, a candidate must produce a certificate from the Head of the department /Institute that the practical for the academic year were completed by the student. However, such a candidate will be allowed to appear for the practical examination but the marks allotted for the journal will not be granted.
10. HOD's decision, in consultation with the Principal, shall remain final and abiding to all.

Evaluation and Assessment

Evaluation (Theory): Total marks per course - 100.

CIA- 40 marks

CIA 1: Written test -20 marks

CIA 2: Written Test / Assignment / Field Trip/mini project/ & Report - 20 marks

Semester End Examination – 60 marks

Question paper covering all units

Evaluation of Practicals 200 marks (50 marks for each practical)

Course Semester End Examination in M Sc. Semester I

Question	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
Unit 1	06	03	03	12
Unit 2	06	03	03	12
Unit 3	06	03	03	12
Unit 4	06	03	03	12
Short notes from topics covering all the units	06	03	03	12
-TOTAL- Per objective	30	15	15	60
% WEIGHTAGE	50	25	25	100%

Evaluation of Practicals 200 marks/Semester

SEMESTER I: (50 marks for each practical RJSPGBOTP101, RJSPGBOTP102, RJSPGBOTP103 & RJSPGBOTP104)

Continuous Evaluation of practical components which require adequate duration for completion of the task, observation and interpretation: 40%

Course end Practical Evaluation of skills of students in terms of skill, analysis, interpretation and conclusion.

M.Sc. Semester I Botany Syllabus**ASSESSMENT OF BOTANY FIELD TRIP REPORT**

Dept. of Botany Course Code _____ Date _____ Roll No _____

Name of student: _____ UID No _____

Marks ____/20 Place of visit _____

Assessment Grid :Place one tick in each appropriate row. Overall mark should reflect the positions of ticks in the individual rows

(20)	Field Trip and Report	80-100% 17-20 Marks	60-80% 13-16 Marks	40-60% 09-12 Marks	20-40% 05-08 Marks
30% (06)	Organization of report	Introduction about the location, vegetation, Botanical Names, Family, Local name, Description using Botanical Term, reporting all the species seen, Handwritten or typed.	Few mistakes,	Many mistakes	Inadequate presentation
		6	5	4	3
50% (10)	Content	Excellent reporting of all the species observed in the field, ecological and morphological data,	Good reporting, species observed in the field but few of them missing in the list	Satisfactory, many species or relevant data missing from the report	Poor, inadequate and insufficient data or just a list of the species without any data.
		10/9	8	6	5
10% (02)	Conclusion	Conclusion based on self observation. Type of forest and vegetation	Good conclusion, comments not independent	Satisfactory, but insufficient	Poor, irrelevant conclusion
	----Marks----	2	2 / 1	1 / 0.5	0.5
5% (01)	References	Proper references, in required format	Proper references but no format	Few references	Irrelevant references
	----Marks----	1	1	0.5	0
5% (01)	Attendance / participation	Attended and participated actively	Attended and participated	Infrequent Participation	No participation
	----Marks----	1	1	0.5	0

Comments:

Name and Signature of Faculty

Project PG level Dept. of Course Code _____ Date _____

UIDNo _____ Roll No _____ Marks _____/20

Name of student -----

Title of Assignment: _____

Assessment Grid :Place one tick in each appropriate row. Overall mark should reflect the positions of ticks in the individual rows. In boxes that have more than one set of marks, cancel out the marks that are not applicable and circle the correct marks.

Project work and report (Parameters)	Marks	80 – 100% Excellent	60 -80% Good	40 – 60% Satisfactory	20 – 40% Average
Project work done	10	10 / 9	8 / 7	6 / 5	4 / 3
Report writing and conclusions	10	10 / 9	8 / 7	6 / 5	4 / 3

M.Sc. Semester I Botany Syllabus