

**SWAMI RAMANAND TEERTH  
MARATHWADA UNIVERSITY, NANDED.**

**B.Sc. GENERAL (SEMESTER PATTERN)  
B.Sc. Third YEAR  
BOTANY - CURRICULUM**

**w.e.f. June - 2011**

## INTRODUCTION

Revising and updating of the curricula is the continuous process to provide an updated education to the students at large. Up till now there was wide diversity in the curricula of different Indian Universities which inhibited mobility of students in other universities or states. To ensure and have uniform curricula at UG and PG levels in different Indian Universities, the UGC developed a model curriculum and forwarded the same to all the universities in the country to serve as a base in updating their respective curricula.

For developing the final draft of curriculum, the BOS in Botany took into account total number of teaching days available in a year and the guidelines given by the faculty of science of the S.R.T.M.U Nanded. The BOS in Botany held a couple of meetings in which there were thorough and critical discussions.

S.R.T.M.U. Nanded is having B.Sc. (General) Botany course. The course content has been designed on semester pattern.

The course content of each theory paper is divided into units and subunits by giving appropriate titles and subtitles. For each unit, total number of periods required and weightage of maximum marks is mentioned. At the end of each theory paper the list of selected reading material is provided. A list of practical exercises to be completed in the academic year is also given. Paper wise skeleton question paper is provided as a guideline to teachers, students and paper setters.

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## **OBJECTIVES**

1. To evolve uniform curricula in all the universities of the country and to provide mobility to students from one university or state to other
2. To update curricula by introducing recent advances in the subject and enable the students to face NET, SET UPSC and other competitive examinations successfully.
3. To create awareness among the students about the botany and train them in the subject.
4. To improve the quality of laboratory and field work, for which study tours and excursions have been made compulsory so that the students can become familiar with the flora and ecosystems of that area.
5. To prepare such a dynamic curricula by incorporating innovative concepts and a multidisciplinary approach which can attract and develop interest among the students for selecting plant science as their career.

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. GENERAL (SEMESTER PATTERN)  
BOTANY –CURRICULUM**

**B.Sc.I Year Botany Curriculum (w.e.f.June, 2009):**

<b>Class</b>	<b>Paper No.</b>	<b>Title of Paper</b>	<b>Periods/ Practicals</b>	<b>Time duration of Examination</b>	<b>Maximum Marks</b>
B.Sc.I Semester-I	I (Th.)	Diversity of Microbes	45	3 Hrs.	50+10
	II (Th.)	Histology and Anatomy	45	3 Hrs.	50+10
B.Sc.I Semester-II	I (Th.)	Diversity of Cryptogams	45	3 Hrs.	50+10
	II (Th.)	Embryology of angiosperms and Environmental biology	45	3 Hrs.	50+10
B.Sc.I	III (Practical) Annual pattern	Practical based on theory papers of semester-I&II	20+4	4 Hrs.	60

**Total B.Sc. First Year Botany:**

Two theory papers of Sem-I - 100 Marks  
 Two theory papers of Sem-II - 100 Marks  
 Two practical papers of annual pattern - 100 Marks,

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Total - 300 Marks

**Workload:**

**Theory:** Per paper per week three periods

**Practical:** Per batch per week one practical (Three periods)

**B.Sc.II Year Botany Curriculum (w.e.f.June, 2010):**

<b>Paper No</b>	<b>Title Of The Paper</b>	<b>Periods/ Practicals</b>	<b>Marks</b>	<b>Time Duration</b>
Semester III Theory Paper VI	Morphology and taxonomy of angiosperm	45	50	3 Hrs
Semester III Theory Paper VII	Plant Physiology	45	50	3 Hrs
Semester IV Theory Paper VIII	Seed plants and their Utilization	45	50	3 Hrs
Semester IV Theory Paper IX	Plant Metabolism and Biochemistry	45	50	3 Hrs
Practical Paper X	Based on Theory Paper – VI ands VIII	20 + 4	50	4 Hrs
Practical Paper XI	Based on Theory Paper – VII and IX	20 + 4	50	4 Hrs

**Total B.Sc. Second Year Botany:**

Two theory papers of Sem-III - 100 Marks  
Two theory papers of Sem-IV - 100 Marks  
Two practical papers of annual pattern - 100 Marks,

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Total - 300 Marks

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**Workload:**

**Theory:** Per paper per week three periods

**Practical:** Per batch per week one practical (Three periods)

**B.Sc.III Year Botany Curriculum (w.e.f.June, 2011):**

Semester	Paper No.	Title of the paper	Periods / Practical	Marks	Time Duration
<b>Semester-V</b>	Theory Paper-XII <b>(Compulsory)</b>	Cell and Molecular Biology	45	50	3 Hrs
	Theory Paper -XIII <b>(Optional)</b>	1. Plant pathology-I 2. Systematic botany-I 3. Molecular biology and Plant Biotechnology-I 4. Seed technology and Plant breeding-I	45	50	3 Hrs
<b>Semester-VI</b>	Theory Paper-XIV <b>(Compulsory)</b>	Genetics and Biotechnology	45	50	3 Hrs
	Theory Paper -XV <b>(Optional)</b>	1. Plant pathology-II 2. Systematic botany-II 3. Molecular biology and Plant Biotechnology-II 4. Seed technology and Plant breeding-II	45	50	3 Hrs
<b>Annual pattern</b>	Practical Paper-XVI	Based on Theory Papers –XII&XIV	20 + 4	50	4 Hrs
	Practical Paper-XVII	Based on Theory Papers –XIII&XV	20 + 4	50	4 Hrs

**Total B.Sc. Third Year Botany:**

Two theory papers of Sem-V - 100 Marks  
 Two theory papers of Sem-VI - 100 Marks  
 Two practical papers of annual pattern - 100 Marks,

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Total - 300 Marks

**Workload:**

**Theory:** Per paper per week three periods

**Practical:** Per batch per week one practical (Three periods)

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year  
Semester - V  
BOTANY  
Theory Paper-XII (Compulsory)  
(Cell and Molecular Biology)**

**Periods: 45**

**Marks: 50**

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**UNIT –I: CELL BIOLOGY (10 PERIODS)**

1. Ultra structure of prokaryotic cell and eukaryotic cell.
2. Structure and functions of cell organelles: Nucleus (Nuclear membrane and nucleolus), Golgi apparatus, Lysosomes, Endoplasmic reticulum and Ribosomes

**UNIT –II: CELL BIOLOGY (13 PERIODS)**

1. Chromosome: Morphology, structure and function of typical chromosome. Karyotype and idiogram structure and significance of giant chromosomes: polytene chromosome and Lamp brush chromosome
2. Cell cycle : G<sub>0</sub> - G<sub>1</sub> - S - G<sub>2</sub> phase. Cell division: Process and significance of Mitosis and Meiosis

**UNIT –III: MOLECULAR BIOLOGY (10 PERIODS)**

1. Structure of DNA (Watson and Crick model) A, B & Z - DNA Replication of DNA (Meselson and Stahl expt.)
2. Structure, function and types of mRNA, tRNA and rRNA

**UNIT –IV: MOLECULAR BIOLOGY (12 PERIODS)**

1. Gene and Gene mutation : Classical concept of gene (theory of Morgan) fine structure of gene (*S. Benzer's*)
2. Gene mutation and related diseases : Phenylketonuria (PKU), Alkaptonuria (AKU), Albinism and Amniocentesis (Detection of genetic diseases).

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SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year  
Semester - V  
BOTANY  
Theory Paper-XII (Compulsory  
(Cell and Molecular Biology)**

Time: 2.10 hours

Maximum Marks: 25

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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|--|------------------------|
| <b>Q1. Compulsory questions on basic concepts:</b><br>(Five questions of one mark each from all units) | <b>05</b>              |
| <b>Q2. Short answer type question from all units:</b><br>(Any two of the four questions)               | <b>10</b>              |
| <b>Q3. Long answer type question:</b><br><b>OR</b><br><b>Long answer type question:</b>                | <b>10</b><br><b>10</b> |

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**Semester - V**

**BOTANY**

**Theory Paper-XIII (Optional)**

**(Plant pathology - I)**

**Periods: 45**

**Marks: 50**

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**UNIT –I: INTRODUCTION TO PLANT PATHOLOGY (10 PERIODS)**

1. Brief history and development of plant pathology with special emphasis on plant pathology in India
2. Scope and significance of plant pathology, Concept of plant disease, Causes of plant disease,
3. Classification of plant diseases on the basis of causal agents, symptoms and spread (Air, soil and seed)

**UNIT –II: PLANT DISEASE DIAGNOSIS AND SEED PATHOLOGY (13PERIODS)**

1. Plant disease diagnosis: Field and laboratory diagnosis- Isolation of plant pathogens, pure culture techniques, Koch's postulates
2. Seed pathology: Detection of seed borne pathogens- external and internal
3. Biodeterioration of storage food grains and fruits

**UNIT –III: PLANT DISEASE-I (12 PERIODS)**

Symptoms, causal organism, disease cycle and control measures of the following diseases

1. Black stem rust of Wheat
2. Grain smut of Jowar
3. Loose smut of Wheat
4. Green ear of Bajra

**UNIT –IV: PLANT DISEASE-I (10 PERIODS)**

Symptoms, causal organism, disease cycle and control measures of the following diseases

1. Ergot of Bajra
2. Citrus canker
3. Root knot of Tomato
4. Powdery mildew of Black gram
5. Wilt of pigeon pea

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SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year  
Semester - V  
BOTANY  
Theory Paper-XIII (Optional)  
(Plant pathology - I)**

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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|--|------------------------|
| <b>Q1. Compulsory questions on basic concepts:</b><br>(Five questions of one mark each from all units) | <b>05</b>              |
| <b>Q2. Short answer type question from all units:</b><br>(Any two of the four questions)               | <b>10</b>              |
| <b>Q3. Long answer type question:</b><br><b>OR</b><br><b>Long answer type question:</b>                | <b>10</b><br><b>10</b> |

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**Semester - V**

**BOTANY**

**Theory Paper-XIII (Optional)**

**(Systematic botany-I)**

**Periods: 45**

**Marks: 50**

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**UNIT –I: CLASSIFICATION (13 PERIODS)**

1. Introduction: Definition, aims, scope and application of angiosperm taxonomy
2. Types of classification: Artificial, Natural and phylogenetic
3. Detail account of Bentham and Hooker's system of classification of angiosperms with merits and demerits
4. Detail account of Engler and Prantle's system of classification of angiosperms with merits and demerits
5. Detail account of Hutchinson's system of classification of angiosperms with merits and demerits

**UNIT –II: PRINCIPLES OF TAXONOMY (10 PERIODS)**

1. ICBN (International Code of Botanical Nomenclature): Brief history, principle of priority, effective and valid publication, typification
2. Species concept (Morphological, taxonomical and biological)
3. Role of phytochemistry in relation to taxonomy
4. Role of cytology in relation to taxonomy
5. Role of anatomy in relation to taxonomy

**UNIT –III: ORIGIN OF ANGIOSPERMS (10PERIODS)**

1. Benettitalean theory
2. Gnetalean theory
3. Pteridosperm theory
4. Concept of primitive flower of angiosperms

**UNIT –IV: TAXONOMIC TOOLS (12 PERIODS)**

1. Herbarium: Techniques of plant preservation
2. Importance of herbarium
3. Role of Botanical gardens in plant taxonomy
4. Important Botanical gardens
5. Use of keys in plant identification

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**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year  
Semester - V  
BOTANY  
Theory Paper-XIII (Optional)  
(Systematic botany-I)**

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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|--|------------------------|
| <b>Q1. Compulsory questions on basic concepts:</b><br>(Five questions of one mark each from all units) | <b>05</b>              |
| <b>Q2. Short answer type question from all units:</b><br>(Any two of the four questions)               | <b>10</b>              |
| <b>Q3. Long answer type question:</b><br><b>OR</b><br><b>Long answer type question:</b>                | <b>10</b><br><b>10</b> |

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**Semester - V**

**BOTANY**

**Theory Paper-XIII (Optional)**

**(Molecular Biology and Plant Biotechnology-I)**

**Periods: 45**

**Marks: 50**

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**UNIT –I: CHEMICAL NATURE OF GENETIC MATERIAL (10 PERIODS)**

Introduction, Constituent of nucleic acid, variation from Watson & Crick model- a, b & z, DNA,

Denaturation and melting curve, transcription apparatus, RNA, Polymerases and proteins involved in transcription (initiation, elongation and termination steps)

**UNIT –II: DNA REPLICATION (13 PERIODS)**

Model of DNA replication: semi conservative mechanism of DNA replication in *E.coli* (Bi-directional, Meselson and Stahl experiment),

Eukaryotic telomeres and its replication, enzymes involved in replication, step by step process

**UNIT –III: PLANT BIOTECHNOLOGY- I (12 PERIODS)**

Protoplast isolation, Protoplast fusion, Anther culture – Somatic embryogenesis  
Secondary Metabolites.

**UNIT –IV: PLANT BIOTECHNOLOGY- II (10 PERIODS)**

Single cell protein (SCP)

Biogas technology in India, Bio fertilizers, Plant Biomass, Applications of Plant Biotechnology

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SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year  
Semester - V  
BOTANY  
Theory Paper-XIII (Optional)  
(Molecular Biology and Plant Biotechnology-I)**

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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<b>Q1. Compulsory questions on basic concepts:</b>	<b>05</b>
(Five questions of one mark each from all units)	
<b>Q2. Short answer type question from all units:</b>	<b>10</b>
(Any two of the four questions)	
<b>Q3. Long answer type question:</b>	<b>10</b>
<b>OR</b>	
<b>Long answer type question:</b>	<b>10</b>

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**Semester - V**

**BOTANY**

**Theory Paper-XIII**

(Seed technology and Plant breeding-I)

**Periods: 45**

**Marks: 50**

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**UNIT –I: SEED DEVELOPMENT, SEED MORPHOLOGY (10 PERIODS)**

1. Introduction and importance of seed technology
2. Roll of seed industries in seed technology in India
3. Seed: Definition, types and morphology of monocot and dicot seeds
4. Seed dormancy: Factors affecting seed dormancy, methods of breaking seed Dormancy

**UNIT –II SEED PHYSIOLOGY (12 PERIODS)**

- 1 Seed germination: Types, factors affecting seed germination,
- 2 mobilization of food reserves during seed germination,
- 3 Seedling abnormalities in major monocot and dicot seeds (any two forms of each)

**UNIT –III: GENETIC PRINCIPLES OF SEED PRODUCTION (10 PERIODS)**

1. Principles: Genetic principle
2. Deterioration of varieties,
3. Maintenance of genetic purity during seed production;
4. Agronomic principle

**UNIT –IV : HYBRID SEED PRODUCTION (13 PERIODS)**

1. Hybrid seed production: Cereals- Sorghum and Maize,
2. Pulses- Pea and Soyabean,
3. Oil seeds- Groundnut and Sunflower,
4. Fibre crop-Cotton,
5. Cash crop.Sugarcane

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SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year**

**Semester - V**

**BOTANY**

**Theory Paper-XIII (Optional Paper)**

(Seed technology and Plant breeding-I)

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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<b>Q1. Compulsory questions on basic concepts:</b>	<b>05</b>
(Five questions of one mark each from all units)	
<b>Q2. Short answer type question from all units:</b>	<b>10</b>
(Any two of the four questions)	
<b>Q3. Long answer type question:</b>	<b>10</b>
<b>OR</b>	
<b>Long answer type question:</b>	<b>10</b>

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SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED

**B.Sc. Third Year**  
**Semester - VI**  
**BOTANY**  
**Theory Paper-XIV (Compulsory)**  
**(Genetics and Biotechnology)**

**Periods: 45**

**Marks: 50**

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**UNIT –I: GENETICS (10 PERIODS)**

1. Mendelism: Mendel's Laws of inheritance. Explanation and examples of (Monohybrid, dihybrid cross and Back cross-test cross)
2. Gene interaction and epistasis (Allelic and non allelic) explanation and examples of 9:7, 9:3:4, 12:3:1 and 15:1 ratios, *Collaborator gene* : comb shape in fowl. {Simple problems based on above ratios, (only in practical's)}
3. Linkage : (Definitions and significance) Coupling and repulsion hypothesis. Type of linkage (maize and drosophila)

**UNIT –II: GENETICS (13 PERIODS)**

1. Sex linked inheritance : Definition classification (x-linked, y-linked and xylinked)
  - a) Sex linked inheritance in *Drosophila* (White eye colour)
  - b) Sex linked inheritance in *Man* (Hemophilia, colour blindness and Holandric gene - hypertrochosis)
  - c) Sex linked inheritance in *Birds* (Barred feathers) (Simple problems : based on above, only in practical's)
2. Sex determination : Discovery o sex chromosomes, chromosomal theory of sex determination - in insects (XO-XX), Birds (ZW-ZZ method), Animals (*Drosophila* and *Man*), Plants (*Melandrium* and *Asparagus*).

**UNIT –III: GENETICS (10 PERIODS)**

1. Genetic variations : Polyploidy : (Haploids, diploids, Triploids, Tetraploids and polyploids) Euploidy- Autopolyploidy and Allopolyploidy with reference to *Raphanobrassica* and Hexaploid wheat : Aneuploidy (hyper and Hypoploidy) : Syndromes in *Man* (Autosomal and sex - chromosomal syndromes)
  - i) Down's syndrome ii) Edwards syndrome iii) Patau's syndrome iv) Turner's Syndrome v) Klinfelters syndrome.

**UNIT –IV: BIOTECHNOLOGY (12 PERIODS)**

1. Genetic Engineering : introduction, tools and technique of r-DNA technology (cloning vectors and Gene cloning technique). Genomic and c-DNA libraries;
2. Agrobacterium mediated gene transfer: (Biology of Agrobacterium, Ti - plasmid, structure of T-DNA and Agrobacterium mediated transfer technique).
3. Transgenic plants (Insect resistant, herbicide resistant and pathogen resistant)

4. Tissue culture : Basic concepts, technique of tissue culture (Steps involved) callus culture, differentiation and morphogenesis, plantlets, protoplast culture and Anther culture

5. Applications of Tissue culture.

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year**

**Semester - VI**

**BOTANY**

**Theory Paper-XIV (Compulsory)**

**(Genetics and Biotechnology)**

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note: (i) Attempt all questions**

(ii) All questions carry equal marks

(iii) Draw neat and well labeled diagrams wherever necessary

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**Q1. Compulsory questions on basic concepts: 05**  
(Five questions of one mark each from all units)

**Q2. Short answer type question from all units: 10**  
(Any two of the four questions)

**Q3. Long answer type question: 10**  
**OR**

**Long answer type question: 10**

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year  
Semester - VI  
BOTANY  
Theory Paper-XV (Optional)  
(Plant pathology - II)**

**Periods: 45**

**Marks: 50**

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**UNIT –I: DISEASE DEVELOPMENT (12 PERIODS)**

1. Disease Development: Mode of entry of plant pathogens (through stomata, wounds, buds and root hairs), Direct penetration
2. Role of environment on disease development: Temperature, moisture, wind and pH
3. Role of toxins in disease development: Victorin, Fusaric acid, Mycotoxins,
4. General account of cell wall degrading enzymes-Pectinases and celluloses, Role of amylases, proteases, lipases

**UNIT –II: DEFENCE MECHANISM IN PLANTS (13 PERIODS)**

1. Defense mechanism in plants-Structural and biochemical
2. Plant disease management: Improved cultural practices, exclusion, eradication, physical methods
3. Chemical control: Copper sulphur and systematic fungicides, antibiotics
4. Biological control: Use of botanicals, IPM

**UNIT –III: PLANT DISEASE-I (10 PERIODS)**

Symptoms, causal organism, disease cycle and control measures of the following diseases

1. Leaf spot of Groundnut (Tikka)
2. Leaf spot of Turmeric
3. Leaf spot of Tomato
4. Late blight of Potato

**UNIT –IV: PLANT DISEASE-II (10 PERIODS)**

Symptoms, causal organism, disease cycle and control measures of the following diseases

1. Little leaf of Brinjal
2. Downy mildew of Grapes
3. White rust of Mustard
4. Whip smut of Sugarcane
5. Yellow vein mosaic of Bhendi

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year  
Semester - VI  
BOTANY  
Theory Paper-XV (Optional)  
(Plant pathology - II)**

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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|--|------------------------|
| <b>Q1. Compulsory questions on basic concepts:</b><br>(Five questions of one mark each from all units) | <b>05</b>              |
| <b>Q2. Short answer type question from all units:</b><br>(Any two of the four questions)               | <b>10</b>              |
| <b>Q3. Long answer type question:</b><br><b>OR</b><br><b>Long answer type question:</b>                | <b>10</b><br><b>10</b> |

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year  
Semester - VI  
BOTANY  
Theory Paper-XV (Optional)  
(Systematic botany-II)**

**Periods: 45**

**Marks: 50**

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**UNIT –I: STUDY OF DICOT FAMILIES (POLYPETALAE) (13 PERIODS)**

Study of following families according to Bentham and hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance

Polypetalae: Papaveraceae, Capparidaceae Combretaceae, Myrtaceae, Rutaceae  
Cucurbitaceae

**UNIT –II: STUDY OF DICOT FAMILIES (GAMOPETALAEAND APETALAE)  
(12 PERIODS)**

Study of following families according to Bentham and hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance

Gamopetalae and Apetalae: Rubiaceae, Asclepiadaceae, Apocynaceae, Convolvulaceae, Verbenaceae, Nyctaginaceae

**UNIT –III: STUDY OF MONOCOT FAMILIES (10 PERIODS)**

Study of following families according to Bentham and hooker's system of classification with reference to general characters, pollination, floral formulae, floral diagrams, systematic position, distinguishing features and economic importance

Orchidaceae Musaceae Zingiberaceae, Cannaceae, Marantaceae, Commelinaceae, Cyperaceae

**UNIT –III: PALYNOLOGY (10 PERIODS)**

Morphoforms of pollen grains with reference to size, shape, polarity, symmetry, pollen wall and apertures. Study of the pollen grains of Hibiscus, Datura, Ipomoea and Grasses.

Economic importance of palynology

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SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year  
Semester - VI  
BOTANY  
Theory Paper-XV (Optional)  
(Systematic botany-II)**

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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|---|-----------|
| <b>Q1. Compulsory questions on basic concepts:</b>    | <b>05</b> |
| (Five questions of one mark each from all units)      |           |
| <b>Q2. Short answer type question from all units:</b> | <b>10</b> |
| (Any two of the four questions)                       |           |
| <b>Q3. Long answer type question:</b>                 | <b>10</b> |
| <b>OR</b>   |           |
| <b>Long answer type question:</b>                     | <b>10</b> |

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year  
Semester - VI  
BOTANY  
Theory Paper-XV (Optional)  
(Molecular Biology and Plant Biotechnology-II)**

**Periods: 45**

**Marks: 50**

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**UNIT –I: CHEMICAL NATURE OF GENETIC MATERIAL (10 PERIODS)**

Introduction, Constituent of nucleic acid, variation from Watson & Crick model- a, b & z, DNA, Denaturation and melting curve, transcription apparatus, RNA, Polymerases and proteins involved in transcription (initiation, elongation and termination steps)

**UNIT –II: DNA REPLICATION (12 PERIODS)**

Model of DNA replication: semi conservative mechanism of DNA replication in *E.coli* (Bi-directional, Meselson and Stahl experiment), Eukaryotic telomeres and its replication, enzymes involved in replication, step by step process

**UNIT –III: PLANT BIOTECHNOLOGY – I (10 PERIODS)**

Introduction, Plant genes – useful plant genes, Isolation of genes, characteristics of genes, Micropropagation – Application and advantages, systems of micropropagation

**UNIT –IV: PLANT BIOTECHNOLOGY – II (13 PERIODS)**

Biological nitrogen Fixation – regulation of nod gene expression, Transfer of nif gene. Applications of plant Biotechnology in Agriculture & industry.

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SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year  
Semester - V  
BOTANY  
Theory Paper-XIII (Optional)  
(Molecular Biology and Plant Biotechnology-I)**

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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|--|------------------------|
| <b>Q1. Compulsory questions on basic concepts:</b><br>(Five questions of one mark each from all units) | <b>05</b>              |
| <b>Q2. Short answer type question from all units:</b><br>(Any two of the four questions)               | <b>10</b>              |
| <b>Q3. Long answer type question:</b><br><b>OR</b><br><b>Long answer type question:</b>                | <b>10</b><br><b>10</b> |

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**Semester - VI**

**BOTANY**

**Theory Paper-XV (Optional)**

(Seed technology and Plant breeding-II)

**Periods: 45**

**Marks: 50**

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**UNIT –I: INTRODUCTION TO SEED PATHOLOGY (10 PERIODS)**

1. Seed pathology: Seed infection- Seed borne pathogens (External and internal)
2. Methods of studying seed borne pathogens
3. Transmission of seed borne pathogens- Methods (Seed to plant, plant to seed, seed to seed, plant to plant)

**UNIT –II: SEED HEALTH TESTING (10 PERIODS)**

1. Seed health testing: Kinds of seed inoculum principles,
2. Methods of seed health testing,
3. seed purity and determination of other species, seed moisture content and it's effect

**UNIT –III: SEED CERTIFICATION (12 PERIODS)**

1. Seed certification: Definition, minimum seed certification standards, ISTA certificates
2. Quarantine: seed quarantine, plant quarantine in India,
3. Importance and principles of quarantine

**UNIT –III: SEED PROCESSING, STORAGE AND MARKETING (13 PERIODS)**

1. Seed processing: Seed drying, treatment, cleaning, upgrading and packing
2. Seed storage: seed viability and seed vigour test
3. Marketing of seeds

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SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED

**SKELETON OF QUESTION PAPER**

**B.Sc. Third Year**

**Semester - VI**

**BOTANY**

**Theory Paper-XV (Optional)**

(Seed technology and Plant breeding-II)

**Time: 2.10 hours**

**Maximum Marks: 25**

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**Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary

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<b>Q1. Compulsory questions on basic concepts:</b>	<b>05</b>
(Five questions of one mark each from all units)	
<b>Q2. Short answer type question from all units:</b>	<b>10</b>
(Any two of the four questions)	
<b>Q3. Long answer type question:</b>	<b>10</b>
<b>OR</b>	
<b>Long answer type question:</b>	<b>10</b>

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year  
(Annual Pattern)  
BOTANY**

**Practical Paper-XVI - Based on theory papers-XII& XIV (Compulsory)  
(Cell and Molecular Biology & Genetics and Biotechnology)**

**Practical: 24**

**Marks: 50**

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**Practical-01:** Study of cell organelles with the help of photocopies / slides.

**Practical-02:** Study of giant chromosome with the help of photocopies / slides.

**Practical-03:** Study of Salivary gland chromosome from chironomous larvae.

**Practical-04:** Cell division - study of mitosis (Onion/Garlic/ Any other available material - Root tips).

**Practical-05:** Study of Mitotic index (of above material)

**Practical-06:** Study of karyotype and idiogram from photocopies of onion / Aloe plant material.

**Practical-07:** Meiosis from onion / maize floral buds or any other available material.

**Practical-08-14:** Problems based on monohybrid/Dihybrid ratio; 9:7/9:3:4/12:3:1/15:1 ratios and collaborator gene.

**Practical-15-16:** Problems based on sex-linked inheritance.

**Practical-17:** Study of syndromes in Man by using photocopies.

**Practical-18-20:** Tools used in GE/Tissue culture laboratory for sterilization and inoculation. Principle and working of Autoclave, oven, incubator, Laminar Air flow, Inoculating chamber, callus culture, plantlet, Anther culture and protoplast culture

**Practical-21-24:** One Long excursion, one short excursion, visits to tissue culture laboratory/ Biotechnology institute etc.

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**(Annual Pattern)**

**BOTANY**

**Practical Paper-XVI - Based on theory papers-XII& XIV (Compulsory)**

**(Cell and Molecular Biology & Genetics and Biotechnology)**

**Time: 4 hours**

**Maximum Marks: 50**

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**Note: (i) Attempt all questions**

**(ii) All questions carry equal marks**

**(iii) Draw neat and well labeled diagrams wherever necessary**

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**Q.1.** Prepare a temporary squash/Smear of the given material (Root tips/floral buds) identify and describe any two stages of Mitosis /Meiosis, giving reasons. 08

**Q.2.** Calculate the Mitotic index from the given material (Root tips) 06

**OR**

Prepare a karyotype from the given photocopy

**Q.3.** Problems (04) based on: i) Dihybrid ratio ii) Gene interactions iii) collaborator gene iv) Sex linked inheritance. (One problem from each) 20

**Q.4.** Spotting (Any three spots) on: 1) Cell organelle 2) Giant chromos / Chromosome: SAT/Centro mere 3) Syndrome 4) Instrument 5) Callus /Anther/protoplast culture 06

**Q.5.** a) Record Book 05

b) Vivo-Voce 03

c) Submission of wool models of mitosis and meiosis etc. 02

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**(Annual Pattern)**

**BOTANY**

**Practical Paper-XVII - Based on theory papers-XIII& XV (Optional)**

**(Plant Pathology –I& II)**

**Practical: 24**

**Marks: 50**

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**Practical-01:** Study of laboratory equipments- Autoclave, Hot air oven, Inoculating chamber, laminar air flow, Air sampler, Incubator, Centrifuge

**Practical-02:** Preparation of culture media- PDA, NA

**Practical-03:** Micrometry- Calibration of microscope and measurement of spore size

**Practical-04:** Isolation of fungal pathogens from diseased plant parts

**Practical-05:** Isolation and identification of seed-borne pathogens by blotter agar plate method

**Practical-06:** Study of air-borne pathogens from exposed petri plates / air sampler

**Practical-07:** Effect of fungicide on spore germination by hanging drop technique

**Practical-08:** Effect of plant extracts on growth of fungal pathogens by food poison technique

**Practical-09:** Assay of amylases / proteases / lipases produced by fungal pathogens

**Practical-10:** Effect of fungal toxin on seed germination / shoot cuttings

**Practical-11:** Study of symptoms and causal organisms of Black stem rust of wheat

**Practical-12:** Study of symptoms and causal organisms of Late blight of potato

**Practical-13:** Study of symptoms and causal organisms of Downy mildew of grapes

**Practical-14:** Study of symptoms and causal organisms of Tikka disease of groundnut

**Practical-15:** Study of symptoms and causal organisms of Leaf spot of tomato

**Practical-16:** Study of symptoms and causal organisms of Leaf spot of turmeric

**Practical-17:** Study of symptoms and causal organisms of White rust of locally available plants

**Practical-18 to 21:** Study of symptomology of the following diseases-Citrus canker, Root knot of tomato, Little leaf brinjal, Yellow vein mosaic of bhendi, Green ear of bajra, ergot of bajra, Loose smut of wheat, Whip smut of sugarcane, Grain smut of jowar, Wilt of pigeonpea

**Practical-22:** Field visits- at least two visits in each season (Kharif & Rabi)

**Practical-23:** Excursion to plant pathological laboratories, agriculture universities

**Practical-24:** At least one long excursion to National research institutes / centres and universities

**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**(Annual Pattern)**

**BOTANY**

**Practical Paper-XVII - Based on theory papers-XIII& XV (Optional)**

**(Plant Pathology –I& II)**

**Time: 4 hours**

**Maximum Marks: 50**

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- Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary
- 

- Q1.** Calibrate the microscope and measure the size of given spore-A 08
- Q2.** Identify and describe the symptoms and morphology of causal organism from the given specimen-B 08
- Q3.** Identify and describe the symptoms of diseased specimen-C & D 08
- Q4.** Identify, classify and describe any two spore types from exposed culture petriplates / aerobiological slide 08
- Q5.** Identify and describe the given spots-F, G, H & I (F-equipment, G-toxin / enzyme, H-diseased plant material, I-plant protectant) 08
- Q7.** a) Record book 05  
b) Submission 02  
c) Viva-voce 03

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**(Annual Pattern)**

**BOTANY**

**Practical Paper-XVII - Based on theory papers-XIII& XV(Optional)**

**(Systematic Botany –I& II)**

**Practical: 24**

**Marks: 50**

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Description, identification and classification with sketches, floral formulae and floral diagrams of locally available plants of the following families

1. **Practical- 01:** Papaveraceae
2. **Practical- 02:** Capparidaceae
3. **Practical- 03 :** Combretaceae
4. **Practical- 04:** Myrtaceae
5. **Practical- 05:** Rutaceae
6. **Practical- 06:** Cucubitateae
7. **Practical- 07:** Rubiaceae
8. **Practical- 08:** Asclepiadaceae
9. **Practical- 09:** Apocynaceae
10. **Practical- 10:** Convolvulaceae
11. **Practical- 11:** Verbenaceae
12. **Practical- 12:** Nyctaginaceae
13. **Practical- 13:** Musaceae
14. **Practical- 14:** Cannaceae
15. **Practical- 15:** Commelinaceae
16. **Practical- 16:** Preparation of dichotomous key by studying locally available plants of the same family
17. **Practical- 17 to 18:** Identification of at least six locally available plants up to species level with the help of flora (sketches, floral formulae and floral diagrams are not expected)
18. **Practical- 19 to 20:** Study of pollen morphology by temporary preparation of pollen grains of Hibiscus, Datura, Ipomoea and Grasses by using acetolysis method
19. **Practical- 21 to 24:** Botanical excursions

*Note: Student must attend at least one long and two short botanical excursions. They must submit field notebook, excursion report and collection at the time of practical examinations*

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**(Annual Pattern)**

**BOTANY**

**Practical Paper-XVII - Based on theory papers-XIII& XV (Optional)**

**(Systematic Botany –I& II)**

**Time: 4 hours**

**Maximum Marks: 50**

- 
- Note:** (i) Attempt all questions  
(ii) All questions carry equal marks  
(iii) Draw neat and well labeled diagrams wherever necessary
- 

- Q1.** Describe, identify and classify the given specimens-**A&B** to their respective families with floral formulae and floral diagrams 12
- Q2.** Identify the given specimens-**C&D** up to species level with the help of flora 10
- Q3.** Make a temporary preparation of pollen grain of the given specimen-**E**, identify and describe 05
- Q4.** Identify and describe the spots-**F, G, H, I, J** and **K** as per the given instructions (3 spots on morphology; 3 spots on economic importance) 12
- Q7.** a) Record book 05  
b) Submission 02  
c) Viva-voce 03

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**SWAMI RAMANANAD TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. Third Year**

**(Annual Pattern)**

**BOTANY**

**Practical Paper-XVII - Based on theory papers-XIII& XV (Optional)**

**((Molecular Biology and Plant Biotechnology & II**

**Practical: 24**

**Marks: 50**

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**Practical-01:** Isolation of plant genomic DNA

**Practical-02:** Isolation of fungal genomic DNA

**Practical-03:** Isolation of bacterial genomic DNA

**Practical-04:** Isolation of plasmid DNA

**Practical-05:** Estimation of DNA by DPA method

**Practical-06:** UV spectroscopic analysis of DNA

**Practical-07:** Isolation of RNA from *S.cervisiae*

**Practical-08:** Estimation of RNA by Orcinol method

**Practical-09:** UV spectroscopic analysis of RNA

**Practical-10:** Estimation of protein by Folin-Lowery method

**Practical-11:** Isolation of streptomycin resistant mutant of *E.coli*

**Practical-12:** Visualization of DNA by Agarose Gel Electrophoresis

**Practical-13:** Demonstration of restriction enzyme digestion

**Practical-14:** Isolation and visualization of plasmid on agar's gel

**Practical-15:** Restriction mapping

**Practical-16:** Transformation, screening for recombinants

**Practical-17:** Characterization of proteins by poly acryl amide gel electrophoresis

**Practical-18:** Preparation of media and initiation of callus from any one selected plant species

**Practical-19:** Micro propagation of plants( any one)

**Practical-20:** Preparation of synthetic seeds

**Practical-21:** production of alcohol by fermentation and estimation of alcohol

**Practical-22:** Production of biofertilizer

**Practical-23:** Growth curves of bacteria, measurement of growth in liquid cultures

**Practical-24:** Visit to biotechnology national laboratories, institutes, University departments, industry

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