



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

With Effect from June - 2013



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

CURRICULUM DESIGNING COMMITTEE

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|---|----------|
| 1. Dr. Bodke S.S.
Yeshwant Mahavidyalaya, Nanded | Chairman |
| 2. Dr. Kadam A.S.
D.S.M. Mahavidyalaya, Jintur | Member |
| 3. Dr. Mandge S.V.
Shri. SGM College, Loha | Member |
| 4. Dr. Gawai D.U.
Science College, Nanded | Member |
| 5. Dr. Dakore H.G.
P.N.College, Nanded | Member |
| 6. Dr. Aithal S.V.
Vai. D.M.Mahavidyalaya, Degloor | Member |
| 7. Dr. Biradar S.D.
D.S.M.College, Parbhani | Member |
| 8. Dr. Bhadraiah B.
Osmania University, Hyderabad | Member |
| 9. Dr. Patil D.A.
SSVP's Dr. Ghogre Science College, Dhule | Member |
| 10. Dr. Mukadam D.S.
Green Gold seeds Ltd., Walunj | Member |
| 11. Dr. Gacche R.N.
SRTM University, Nanded | Member |

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B.Sc. General (Semester Pattern)

INTRODUCTION

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

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.University, 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.





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B.Sc. General (Semester Pattern)

OBJECTIVES

1. To provide an updated education to the students at large and to provide mobility to students from one university or state to other
2. To update curriculum 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 curriculum 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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B.Sc. General (Semester Pattern)

Class: B.Sc. III Year Curriculum - an outline

Class & Semester	Paper No. & Title	Period /practical	Marks		
			University Examination	Internal Exam	Total
B.Sc. III Year Semester-V	Theory Paper-XII: Cell and Molecular Biology	45	40	10	50
	Theory Paper-XIII: Optional- any one of the following 1. Plant Pathology-I 2. Systematic botany-I 3. Applied Economic Botany-I 4. Herbal Technology-I	45	40	10	50
B.Sc. III Year Semester-VI	Theory Paper-XIV: Genetics and Biotechnology	45	40	10	50
	Theory Paper-XV: Optional- any one of the following 1. Plant Pathology-II 2. Systematic botany-II 3. Applied Economic Botany-II 4. Herbal Technology-II	45	40	10	50
B.Sc. III Year Annual pattern	Practical Paper-XVI: Based on Theory Paper-XII&XIV	24	50	-	50
B.Sc. III Year Annual pattern	Practical Paper-XVII: Based on Theory Paper-XIII&XV	24	50	-	50

Workload: **1. Theory:** Per paper per week three periods
 2. Practical: Per batch per week one practical of three periods

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B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Semester – V

THEORY PAPER-XII: CELL AND MOLECULAR BIOLOGY

(Compulsory)

Periods – 45

Maximum Marks – 40

UNIT –I: CELL BIOLOGY-I (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-II (13 PERIODS)

1. Chromosome: Morphology, structure and function of typical chromosome. Karyotype and Idiogram structure and significance of giant chromosomes: Polytene chromosome and Lampbrush chromosome
2. Cell cycle: $G_0 - G_1 - S - G_2$ phase. Cell division: Process and significance of Mitosis and Meiosis

UNIT –III: MOLECULAR BIOLOGY-I (10 PERIODS)

1. Structure of DNA (Watson and Crick model) Replication of DNA (Meselson and Stahl expt.)
2. Structure, function and types of RNA.

UNIT –IV: MOLECULAR BIOLOGY-II (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).

Theory paper-XII: Cell and Molecular Biology (Compulsory)-Unit wise distribution of periods and marks

Unit	Title	Periods Allotted	Maximum Marks
I	Cell Biology-I	10	18
II	Cell Biology-II	13	20
III	Molecular Biology-I	10	18
IV	Molecular Biology-II	12	20
Total		45	76

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B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Semester – V

Theory Paper-XII

Time: Three hours

Maximum Marks: 40

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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. Long answer type question from Unit-I** **08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II** **08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III** **08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV** **08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following** **08**
a. Short note type question from Unit-I
b. Short note type question from Unit-II
c. Short note type question from Unit-II
d. Short note type question from Unit-III
e. Short note type question from Unit-IV
f. Short note type question from Unit-IV
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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Semester – V

THEORY PAPER-XIII: 1. PLANT PATHOLOGY-I

(Optional-I)

Periods – 45

Maximum Marks – 40

UNIT-I: FUNDAMENTALS OF PLANT PATHOLOGY (10 periods)

Scope, importance, history and advancement of plant pathology, classification of plant diseases on the basis of causal organism and symptoms, Field and laboratory diagnosis- Isolation of plant pathogens from infected plant parts, soil and air, Pure culture technique, Koch's postulates for pathogenicity

UNIT-II: PLANT DISEASE DEVELOPMENT (10 periods)

Disease development- Mode of entry of pathogens (through stomata, wounds, root hairs and buds), Factors affecting disease development- Temperature, moisture, wind and soil pH, Dispersal of plant pathogens (by air, water, insects and animals)

UNIT-III: PLANT DISEASES-I (12 periods)

Symptoms, causal organisms, disease cycle and control measures of Green ear of Bajra, leaf spot of tomato, Grain smut of Jowar, Red rot of Sugarcane, Angular leaf spot of cotton, Yellow vein mosaic of Bhendi

UNIT-IV: PLANT DISEASES-II (13 periods)

Symptoms, causal organisms, disease cycle and control measures of White rust of Mustard, Whip smut of Sugarcane, Powdery mildew of pea, Leaf spot of Turmeric (*Colletotrichum capsici*), Citrus canker, Bean mosaic

Theory paper-XIII: 1. Plant pathology-I (Optional-I) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Fundamentals of Plant Pathology	10	18
II	Plant Disease Development	10	18
III	Plant Diseases-I	12	20
IV	Plant Diseases-II	13	20
Total		45	76

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B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Semester – V

THEORY PAPER-XIII: 1. PLANT PATHOLOGY-I

(Optional-I)

Time: Three hours

Maximum Marks: 40

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

- Q1. Long answer type question from Unit-I** **08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II** **08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III** **08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV** **08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following** **08**
a. Short note type question from Unit-I
b. Short note type question from Unit-II
c. Short note type question from Unit-III
d. Short note type question from Unit-III
e. Short note type question from Unit-IV
f. Short note type question from Unit-IV
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Semester – V

THEORY PAPER-XIII: 2. SYSTEMATIC BOTANY-I

(Optional-II)

Periods – 45

Maximum Marks – 40

UNIT –I: CLASSIFICATION (12 periods)

Introduction- Definition, aims, scope and application of angiosperm taxonomy, Types of classification- Artificial, Natural and Phylogenetic, Outline of Bentham and Hooker, Engler and Prantle and Hutchinson's systems of classification of angiosperms with merits and demerits

UNIT –II: PRINCIPLES OF TAXONOMY (10 periods)

ICBN (International Code of Botanical Nomenclature)-Brief history, principle of priority, effective and valid publication, typification and author citation, Species concept- Morphological, taxonomical and biological, Role of phytochemistry, cytology, anatomy and palynology in relation to taxonomy

UNIT –III: TAXONOMIC TOOLS (10 periods)

Herbarium- Techniques of plant preservation, Importance of herbarium, Botanical gardens- Role in plant taxonomy, Important Botanical gardens, Plant identification key-Use of keys in plant identification

UNIT –IV: 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

Theory paper-XIII: 2. Systematic botany-I (Optional-II) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Classification	12	20
II	Principles of Taxonomy	10	18
III	Taxonomic Tools	10	18
IV	Study of Dicot Families (Polypetalae)	13	20
Total		45	76

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Skeleton Question Paper

B. Sc. THIRD YEAR

Semester – V

THEORY PAPER-XIII: 2. SYSTEMATIC BOTANY-I

(Optional-II)

Time: Three hours

Maximum Marks: 40

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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. Long answer type question from Unit-I** **08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II** **08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III** **08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV** **08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following** **08**
a. Short note type question from Unit-I
b. Short note type question from Unit-I
c. Short note type question from Unit-II
d. Short note type question from Unit-III
e. Short note type question from Unit-IV
f. Short note type question from Unit-IV
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Semester – V

THEORY PAPER-XIII: 3. APPLIED ECONOMIC BOTANY-I

(Optional-III)

Periods – 45

Maximum Marks – 40

UNIT-I: INTRODUCTION TO ECONOMIC BOTANY AND STUDY OF CEREAL PLANTS (10 periods)

Introduction to economic botany- Brief history, origin, scope, nature of plant products, Vavilov's concept of cultivated plants, classification of economic plants, **Study of Cereal plants-** History, origin, cultivation practices, botanical description, nutritional value, varieties and uses of Jowar, Wheat and Rice

UNIT-II: STUDY OF PULSES AND OIL YIELDING PLANTS (12 periods)

History, origin, cultivation practices, botanical description, nutritional value, uses and varieties of **Pulses plants-** Tur, Greengram, Gram, **Oil yielding plants-** Groundnut, Safflower, Soyabean

UNIT-III: STUDY OF VEGETABLE PLANTS (13 periods)

History, origin, cultivation practices, botanical description, nutritional value, uses and varieties of **Root vegetables-** Radish, Carrot, Beetroot, **Stem vegetables-** Potato, Amorphophallus, Colocasia, **Foliage(Herbage) vegetables-** Spinach, Methi, Cabbage, **Fruit vegetables-** Bhendi, Brinjal, Tomato

UNIT-IV: STUDY OF MEDICINAL PLANTS (10 periods)

History, origin, cultivation practices, botanical description, nutritional value, uses and varieties of **Root drug plant-** Ashwgandha, Shatawari, Safed musli, **Stem drug plant-** Neem, Gulwel, Rui (Ruchki), **Flower drug plant-** Jaswand, Dhaiti, Clove(Lavang), **Fruit drug plant-** Behada, Awala, Murudsheng

Theory paper-XIII: 3. Applied economic botany-I (Optional-III) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Introduction to Economic Botany	10	18
II	Study of Food Plants	12	20
III	Study of Vegetable Plants	13	20
IV	Study of Medicinal Plants	10	18
Total		45	76

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Semester – V

THEORY PAPER-XIII: 3. APPLIED ECONOMIC BOTANY-I

(Optional-III)

Time: Three hours

Maximum Marks: 40

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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. Long answer type question from Unit-I** **08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II** **08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III** **08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV** **08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following** **08**
a. Short note type question from Unit-I
b. Short note type question from Unit-II
c. Short note type question from Unit-II
d. Short note type question from Unit-III
e. Short note type question from Unit-III
f. Short note type question from Unit-IV
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Semester – V

THEORY PAPER-XIII: 4. HERBAL TECHNOLOGY-I

(Optional-IV)

Periods – 45

Maximum Marks – 40

UNIT-I: MEDICINAL AND AROMATIC PLANTS (MAP) (10 periods)

Introduction, History, importance, demand and supply of MAP in India and world, Indian trade in MAP, Indian systems of medicine- Ayurvedic, unani, homeopathic, siddha, yoga and naturopathy

UNIT-II: CRUDE PLANT DRUGS (12 periods)

Definition, Classification- Alphabetic, taxonomic, morphological, chemical, pharmacological and chemotaxonomic, Methods of cultivation and factors affecting the cultivation of drug plants, Collection, harvesting, drying and storage of crude drugs, Organized crude drugs- Leaves, stem, flowers, fruits, seeds, barks, underground and entire drugs, Unorganized drugs- Gums, mucilage, resins, dried juices, latex and extracts

UNIT-III: CHARACTERIZATION OF DRUGS (10 periods)

Distribution, morphology, botanical and chemical constituents and uses of **Root drugs**- Shatavari, Ashwagandha, **Stem drugs**- Ginger, turmeric, Dudh kuda, Arjun sadada, Gulvel, Chandan, **Leaf drugs**- Adulsa, Korpad (Aloe), **Fruit drugs**- Behda, Hirda and **Entire plant drugs**- Tulsi and Aghada

UNIT-IV: MEDICINAL PLANT BIOTECHNOLOGY AND STANDARDIZATION OF DRUGS (13 periods)

Genetics as applied to medicinal herbs and transgenic plants, Plant tissue culture as source of biomedicines, Importance of drug standardization, Problems of standardization of herbs, Drug adulteration, Methods of drug evaluation- Morphological, microscopic, chemical, physical and biological

Theory paper-XIII: 4. Herbal technology-I (Optional-IV) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Medicinal and Aromatic Plants (Map)	10	18
II	Crude Plant Drugs	12	20
III	Characterization of Drugs	10	18
IV	Medicinal Plant Biotechnology and Standardization of Drugs	13	20
Total		45	76

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Skeleton Question Paper

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Semester – V

THEORY PAPER-XIII: 4. HERBAL TECHNOLOGY-I

(Optional-IV)

Time: Three hours

Maximum Marks: 40

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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. Long answer type question from Unit-I** **08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II** **08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III** **08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV** **08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following** **08**
a. Short note type question from Unit-I
b. Short note type question from Unit-II
c. Short note type question from Unit-II
d. Short note type question from Unit-III
e. Short note type question from Unit-IV
f. Short note type question from Unit-IV
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B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XIV: GENETICS AND BIOTECHNOLOGY

(Compulsory)

Periods – 45

Maximum Marks – 40

UNIT –I: GENETICS-I (10 PERIODS)

1. Mendelism: Mendel's Laws of inheritance. Explanation and examples of (Monohybrid cross, dihybrid cross and back cross and 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-II (13 PERIODS)

1. Sex linked inheritance: Definition classification (x-linked, y-linked and xy-linked)
 - 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 of 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-III (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) Klinefelters 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), Transgenic plants (Insect resistant, herbicide resistant and pathogen resistant).
4. **Tissue culture:** Introduction, concepts of totipotency of cell, Basic aspects of tissue culture laboratory, technique of tissue culture (Steps involved), callus culture, differentiation and morphogenesis.
5. **Applications of Tissue culture:** Micropropagation with importance, production of secondary metabolites, development of disease free plants, protoplast culture and somatic hybridization, anther culture and production of haploids.

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Theory paper-XIV: Genetics and Biotechnology (Compulsory) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Genetics-I	10	18
II	Genetics-II	13	20
III	Genetics-III	10	18
IV	Biotechnology	12	20
Total		45	76

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B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XIV: GENETICS AND BIOTECHNOLOGY

(Compulsory)

Time: Three hours

Maximum Marks: 40

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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. Long answer type question from Unit-I 08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II 08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III 08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV 08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following 08**
a. Short note type question from Unit-I
b. Short note type question from Unit-II
c. Short note type question from Unit-II
d. Short note type question from Unit-III
e. Short note type question from Unit-IV
f. Short note type question from Unit-IV
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B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XV: 1. PLANT PATHOLOGY-II

(Optional-I)

Periods – 45

Maximum Marks – 40

UNIT-I: AEROBIOLOGY AND SEED PATHOLOGY (10 periods)

Aerobiology- Definition, scope and importance and disease forecasting, Seed pathology- Definition, seed borne pathogens (external and internal) detection of seed borne pathogens by blotter paper and agar plate methods, seed treatment (hot water, solar, chemical,) and seed certification

UNIT-II: DEFENSE MECHANISM AND PLANT DISEASE MANAGEMENT (10 periods)

Structural (pre existing and post infectional) and biochemical defense-pre existing and post infectional (phytoalexins) Exclusion and eradication, Chemical control-General account of Sulphur, Copper, systemic fungicides and antibiotics, Integrated pest management

UNIT-III: PLANT DISEASES-I (12 periods)

Symptoms, causal organisms, disease cycle and control measures of Tikka disease of groundnut, Ergot of Bajra, Loose smut of Wheat, Rust of Jowar, Little leaf of Brinjal, Leaf curl of tomato

UNIT-IV: PLANT DISEASES-II (13 periods)

Symptoms, causal organisms, disease cycle and control measures of Downy mildew of Grape, Stem rust of Wheat, Wilt of Tur, late blight of Potato, Grassy shoot of Sugarcane, Papaya mosaic

Theory paper-XV: 1. Plant pathology-II (Optional-I) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Aerobiology and Seed Pathology	10	18
II	Defense Mechanism and Plant Disease Management	10	18
III	Plant Diseases-I	12	20
IV	Plant Diseases-II	13	20
Total		45	76

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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XV: 1. PLANT PATHOLOGY-II

(Optional-I)

Time: Three hours

Maximum Marks: 40

Note: -

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

- Q1. Long answer type question from Unit-I** **08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II** **08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III** **08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV** **08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following** **08**
a. Short note type question from Unit-I
b. Short note type question from Unit-II
c. Short note type question from Unit-III
d. Short note type question from Unit-III
e. Short note type question from Unit-IV
f. Short note type question from Unit-IV
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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XV: 2. SYSTEMATIC BOTANY-II

(Optional-II)

Periods – 45

Maximum Marks – 40

UNIT –I: STUDY OF DICOT FAMILIES (Gamopetalae and 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 –II: STUDY OF MONOCOT FAMILIES (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

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 of the pollen grains of Hibiscus, Datura, Ipomoea and Grasses. Economic importance of palynology

UNIT –IV: ORIGIN OF ANGIOSPERMS (10 periods)

Introduction, Benettitalean theory, Gnetalean theory, Pteridosperm theory, Concept of primitive flower of angiosperms

Theory paper-XV: 2. Systematic botany-II (Optional-II) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Study of Dicot Families (Gamopetalae and Apetalae)	12	20
II	Study of Monocot Families	13	20
III	Palynology	10	18
IV	Origin of Angiosperms	10	18
Total		45	76

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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XV: 2. SYSTEMATIC BOTANY-II

(Optional-II)

Time: Three hours

Maximum Marks: 40

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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. Long answer type question from Unit-I** **08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II** **08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III** **08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV** **08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following** **08**
a. Short note type question from Unit-I
b. Short note type question from Unit-I
c. Short note type question from Unit-II
d. Short note type question from Unit-II
e. Short note type question from Unit-III
f. Short note type question from Unit-IV
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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XV: 3. APPLIED ECONOMIC BOTANY-II

(Optional-III)

Periods – 45

Maximum Marks – 40

UNIT-I: STUDY OF SPICES AND FIBRE PLANTS (10 periods)

History, origin, cultivation practices, botanical description, nutritional value, uses and varieties of **Spices plants**- Dhaniya, Turmeric and Garlic, **Fibre plants**- Cotton, Sunhemp and Ambadi

UNIT-II: STUDY OF BEVERAGE AND OTHER ECONOMIC IMPORTANT PLANTS (13 periods)

History, origin, cultivation practices, botanical description, nutritional value, uses and varieties of **Beverage plants**- Tea, coffee and coca plants, **Timber plants**- Teak, Neem and Babhul, **Wood and cork plants**- Albizzia, Dalbergia and Saffron teak, **Gum and resin plants**- Butea, Khair (*Acacia catechu*) and Gout gum

UNIT-III: STUDY OF INDUSTRIALLY IMPORTANT PLANTS (12 periods)

History, origin, cultivation practices, botanical description, nutritional value, uses and varieties of **Sugar yielding plants**- sugarcane, **Pulp and paper yielding plants**- Bamboo, Banana, **Coir plants**- Coconut, **Tannin and dye yielding plants**- Terminalia, Indigofera, Morinda, **Industrial application of**- Grapes, Maize, Potato, Cotton and Rubber plants

UNIT-IV: STUDY OF BIOENERGY PLANTS (10 periods)

History, origin, cultivation practices, botanical description, nutritional value, uses and varieties of **Bio-fuel plants**- Acacia sp, Azadirachta sp and Lantana, **Petro plants**- Jatropha, Symaruba (Laxmi taru), Karanj and Euphorbia

Theory paper-XV: 3. Applied economic botany-II (Optional-III) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Study of Spices and Fibre Plants	10	18
II	Study of Beverage and Other Economic Important Plants	13	20
III	Study of Industrially Important Plants	12	20
IV	Study of Bioenergy Plants	10	18
Total		45	76

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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XV: 3. APPLIED ECONOMIC BOTANY-II

(Optional-III)

Time: Three hours

Maximum Marks: 40

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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. Long answer type question from Unit-I** **80**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II** **08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III** **08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV** **08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following** **08**
a. Short note type question from Unit-I
b. Short note type question from Unit-II
c. Short note type question from Unit-II
d. Short note type question from Unit-III
e. Short note type question from Unit-III
f. Short note type question from Unit-IV
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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XV: 4. HERBAL TECHNOLOGY-II

(Optional-IV)

Periods – 45

Maximum Marks – 40

UNIT-I: HERBAL FORMULATION (10 periods)

Steps of herbal formulation- Grinding, extraction, filtration, concentration, **Dosage forms-** Infusion, decoction, tincture, capsule, medicated wines, syrups, tablets, ointment and creams, **Comparative study of-** Ayurvedic and modern dosage forms

UNIT-II: BIO-PIRACY OF MEDICINAL PLANTS (10 periods)

Preparation and therapeutic uses of Triphala churna, Kumari asav, Arjunarishtha (Aristha), Gooti, Vatti and Telam

UNIT-III: PHYTOCHEMICAL STUDY OF MEDICINAL PLANTS (12 periods)

Introduction, occurrence and chemistry of carbohydrates, glycosides, alkaloids and steroids

UNIT-IV: DRUG ANALYSIS (13 periods)

Colum chromatography- Introduction, principle, elution methods and applications, **Thin layer chromatography (TLC)-** Introduction, principle, sample preparation and applications, **High performance thin layer chromatography (HPTLC)-** Introduction, principle, sample preparation and applications and **Paper chromatography-** Introduction, principle, sample preparation and applications

Theory paper-XV: 4. Herbal technology-II (Optional-IV) - Unit wise distribution of periods and marks:

Unit	Title	Periods Allotted	Maximum Marks
I	Herbal Formulation	10	18
II	Bio-Piracy of Medicinal Plants	10	18
III	Phytochemical Study of Medicinal Plants	12	20
IV	Drug Analysis	13	20
Total		45	76

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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Semester – VI

THEORY PAPER-XV: 4. HERBAL TECHNOLOGY-II

(Optional-IV)

Time: Three hours

Maximum Marks: 40

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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. Long answer type question from Unit-I 08**
OR
a. Short answer type question from Unit-I
b. Short answer type question from Unit-I
- Q2. Long answer type question from Unit-II 08**
OR
a. Short answer type question from Unit-II
b. Short answer type question from Unit-II
- Q3. Long answer type question from Unit-III 08**
OR
a. Short answer type question from Unit-III
b. Short answer type question from Unit-III
- Q4. Long answer type question from Unit-IV 08**
OR
a. Short answer type question from Unit-IV
b. Short answer type question from Unit-IV
- Q5. Write short notes on any four of the following 08**
a. Short note type question from Unit-I
b. Short note type question from Unit-II
c. Short note type question from Unit-III
d. Short note type question from Unit-III
e. Short note type question from Unit-IV
f. Short note type question from Unit-IV
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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Annual Pattern

PRACTICAL PAPER-XVI: BASED ON THEORY PAPERS-XII & XIV

(Cell and Molecular Biology & Genetics and Biotechnology)

Practical–24

Maximum Marks – 50

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.



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Annual Pattern

PRACTICAL PAPER-XVI: BASED ON THEORY PAPER-XII & XIV

(Compulsory)

Time: Four hours

Maximum Marks: 50

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- Note: -**
- (i) Attempt all questions
 - (ii) Show your preparation to the examiner
 - (iii) Draw neat and well labeled diagrams wherever necessary
-

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 (05 spots) on: 1) Cell organelle (1) 2) Giant chromosome / Chromosome: SAT/Centro mere (1) 3) Syndrome (1), 4) Instrument (1), 5) Callus /Anther/protoplast culture (1) 06

Q.5. a) Record Book 05
b) Viva-Voce 03
c) Submission of wool models of mitosis and meiosis etc. 02

Note: Student must submit field notebook, excursion report and collection at the time of practical examinations.



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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Annual Pattern

PRACTICAL PAPER-XVII: BASED ON THEORY PAPERS-XIII & XV: PLANT PATHOLOGY-I&II

(Optional-I)

Practical–24

Maximum Marks – 50

Practical Exercises:

1. Study of laboratory equipments- Autoclave, Hot air oven, Inoculating chamber, laminar air flow, Air sampler, Incubator, Centrifuge **(1 practical)**
 2. Preparation of culture media- PDA, NA **(1 practical)**
 3. Micrometry- Calibration of microscope and measurement of fungal spore **(1 practical)**
 4. Isolation of fungal pathogens from diseased plant parts **(1 practical)**
 5. Isolation and identification of seed-borne pathogens by blotter / agar plate method **(1 practical)**
 6. Study of air-borne pathogens by exposed petri plates / air sampler **(2 practical)**
 7. Proving of pathogenicity **(1 practical)**
 8. Effect of pH on growth of pathogens **(1 practical)**
 9. Effect of Temperature on growth of pathogens **(1 practical)**
 10. Effect of fungicide on spore germination by hanging drop technique **(2 practical)**
 11. Study of symptoms and causal organisms of Stem rust of wheat **(1 practical)**
 12. Study of symptoms and causal organisms of Late blight of potato and Downy mildew of grapes **(1 practical)**
 13. Study of symptoms and causal organisms of Tikka disease of groundnut **(1 practical)**
 14. Study of symptoms and causal organisms of Leaf spot of tomato and Leaf spot of turmeric **(1 practical)**
 15. Study of symptoms and causal organisms of Rust of Jowar and Grain smut of jowar **(1 practical)**
 16. Study of symptoms and causal organisms of Loose smut of Wheat **(1 practical)**
 17. Study of symptoms and causal organisms of Green ear and ergot of bajra **(1 practical)**
 18. Study of symptoms and causal organisms of Wilt of Tur and Whip smut of sugarcane **(1 practical)**
 19. Study of symptoms and causal organisms of White rust of Mustard / locally available plants **(1 practical)**
 20. Study of symptomology of the following diseases-Citrus canker, Root knot of tomato, Little leaf brinjal, Yellow vein mosaic of bhendi, Angular leaf spot of Cotton, papaya mosaic **(03 practicals)**
 21. Botanical excursions-Several local and at least one long excursion **(4 practical)**
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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Annual Pattern

Practical Paper-XVII: Based on theory papers-XIII & XV: Plant pathology-I&II

(Optional-I)

Time: Four hours

Maximum Marks: 50

Note: -

- (i) Attempt all questions*
- (ii) Show your preparation to the examiner*
- (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 |
| Q6. | a) Record book | 05 |
| | b) Submission | 02 |
| | c) Viva-voce | 03 |
-



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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Annual Pattern

Practical Paper-XVII: Based on theory papers-XIII & XV: Systematic Botany-I&II

(Optional-II)

Practical–24

Maximum Marks – 50

Practical Exercises:

1. Description, identification and classification with sketches, floral formulae and floral diagrams of locally available plants of the following families -
Papaveraceae, Capparidaceae, Combretaceae, Myrtaceae, Rutaceae, Cucubitaceae, Rubiaceae, Asclepiadaceae, Apocynaceae, Convolvulaceae, Verbenaceae, Nyctaginaceae, Musaceae, Cannaceae, Commelinaceae **(15 practical)**
2. Preparation of dichotomous key by studying locally available plants of the same family **(1 practical)**
3. 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) **(2 practical)**
4. Study of pollen morphology by temporary preparation of pollen grains of Hibiscus, Datura, Ipomoea and Grasses by using acetolysis method **(2 practical)**
5. Botanical excursions **(4 practical)**

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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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Skeleton Question Paper

B. Sc. THIRD YEAR

Annual Pattern

Practical Paper-XVII: Based on theory papers-XIII & XV: Systematic Botany-I&II

(Optional-II)

Time: Four hours

Maximum Marks: 50

Note: -

- (i) *Attempt all questions*
- (ii) *Show your preparation to the examiner*
- (iii) *Draw neat and well labeled diagrams wherever necessary*

- | | | |
|------------|--|----|
| Q1. | Describe, identify and classify the given specimen- A & B to its respective families with floral formulae and floral diagrams | 16 |
| Q2. | Identify the given specimen- C up to species level using key and flora | 08 |
| Q3. | Make a temporary preparation of pollen grain of the given specimen- D identify and describe | 08 |
| Q4. | Identify and describe the spots- E, F, G and H as per the given instructions (2 spots on morphology; 2 spots on economic importance) | 08 |
| Q5. | a) Record book | 05 |
| | b) Submission | 02 |
| | c) Viva-voce | 03 |
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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Annual Pattern

Practical Paper-XVII: Based on theory papers-XIII & XV: Applied Economic Botany Botany-I&II

(Optional-III)

Practical–24

Maximum Marks – 50

Practical Exercises:

1. Study of morphology, structure, simple microchemical test of the food storage tissue of Wheat, Jowar, Rice, Maize and Potato **(3 practical)**
2. Microscopic examination of starch in Wheat, Jowar, Rice, Maize and Potato **(2 practical)**
3. Study of cotton flower to trace the origin and development of cellulose**(1 practical)**
4. Study of Jute stem (T.S. and Staining) to show the location and development of fibres and microscopic structure test for lignocellulose **(1 practical)**
5. Study of Vegetable oils (Hand section of groundnut, safflower, soyaben, coconut and staining of oil droplets by sudan-III and sudan black) **(2 practical)**
6. Study of spices and condiments (Identification and description of Dhaniya, Turmeric and Garlic) **(1 practical)**
7. Preparation of an illustrated inventory of **ten** medicinal plants (Botanical and common name, family, uses in indigenous system of medicine and allopathy, diseases/disorders for which they are prescribed) **(4 practical)**
8. Study of boiled coffee and tea leaves for the characterization of structural features**(1 practical)**
9. Study of uses of coconut**(1 practical)**
10. Study of sources of firewood (ten plants), timber yielding plants (ten trees) and bamboos a to be prepared mentioning special features **(4 practical)**
11. Identification and botanical source plant part used and uses of Cotton, coir, sugar, banana and rubber**(2 practical)**
12. Identification , description , botanical source of processed product of garlic, turmeric coriander**(2 practical)**
13. Field visits (Several local and at least a long excursion) **(4 practical)**





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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

B. Sc. THIRD YEAR

Annual Pattern

Practical Paper-XVII: Based on theory papers-XIII & XV: Herbal Technology-I&II

(Optional-IV)

Practical–24

Maximum Marks – 50

Practical Exercises:

1. Macroscopic and microscopic evaluation of medicinal leaf drugs of Vasaka, Eucalyptus, Datura, Senna and Vinka(**3 practical**)
 2. Macroscopic and microscopic evaluation of medicinal drugs of Boerhavia root, Shatavari root, Vinka root, Liquorice and Ginger rhizome(**4 practical**)
 3. Study of leaf constants (Stomatal number, stomatal index and palisade ratio) (**2 practical**)
 4. Preparation of herbal formulation (Tincture, tablets, ointments, creams, capsules and syrups) (**4 practical**)
 5. Preliminary photochemical screening of Carbohydrates, Alkaloids, Glycosides, Steroids, Tannins and Phenolic compounds(**4 practical**)
 6. Separation of Carbohydrates and Glycosides from crude drug by using chromatography / TLC techniques(**4 practical**)
 7. Study of medicinal properties of crude drugs obtained from Vasaka, Senna, Boerhavia, Vinka, Liquorice, Ginger, Shatavari, Datura and Eucalyptus(**3 practical**)
 8. Excursion (Several local and at least one long excursion are compulsory) (**4 practical**)
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Selected Readings for Semester-V & VI:

- A text book of systematic botany – R.N.Sutaria
- A textbook of plant physiology and Biochemistry – Verma S.K.
- Aerobiology – S.T.Tilak
- Anb introduction to taxonomy of angiosperms – N.C.Kumar
- Angiosperms – G.L.Chopra
- College botany – Das, Datta & Ganguly
- College Botany- Sunder Rajan S
- College botany Vol-III – B.P.Pandey
- Diseases of crop plants in India – G.Rangaswami
- Diseases of crop plants in India – G.Rangaswami & Mahadevan
- Economic Botany – Hill A.F.
- Economic botany – S.N.Pandey & A. Chanda
- Economic botany – Sharma & Avasthi
- Elements of plant physiology – Sarabhai B.P.
- Essentiales of plant pathology – V.N.Pathak
- Experiments in plant physiology – Bajraracharya D.
- Experments in microbiology, plant pathology, tissue culture & mushroom cultivation – K.R.Aneja
- Flora of Kolhapur – S.R.Yadav & Sardesai
- Flora of Maharashtra – Almeda
- Flora of Marathwada – Chief Ed. By Dr. V.N. Naik
- Flora of Osmanabad – V. N. Naik.
- Flora of Tirupati – Madhed Chetty
- Flowering plants – Origin and dispersal – A.L. Takhtajan
- Fungi and plant diseases – B.B.Mundkur
- Fungicides in plant diseases control – Y.L.Nene
- Illustrated genera of fungi imperfectii – Barnett
- Illustrated kingdom of fungi – D.S.Mukadam
- Introduction to Principles of Plant Pathology – R.S.Singh
- Plant Dieases – R.S.Singh
- Plant Pathaology – B.P.Pandey
- Plant Pathaology – G.N.Agrios
- Plant Pathaology – R.S.Mehrotra
- Plant physiology – Dubey B.P.
- Plant physiology – Shrivastava H.S.
- Plant physiology, a laboratory guide – Wadje S.S. & MMV Baig
- Plant protection – Chattopadhyay
- Pollen morphology of angiosperms – N.P.K.Nair
- Seed pathology – D. Suryanarayana
- Seed pathology – D.K.Jha
- Seed pathology- Paul Neergaard
- Takhtajan A.L. (1997) Diversity and classification of flowering plant – Colubia University, press New York.
- Taxonomy of angiosperms – B.P.Pandey
- Taxonomy of angiosperms – P.C.Vasistha
- Taxonomy of angiosperms – Singh V. & D.K.Jain
- Taxonomy of angiosperms – V.N.Naik
- Taxonomy of angiosperms – Vasudevan Nair
- Taxonomy of Vascular plants – Lawrence G.H.M.
- Text book of Modern plant pathology – K.S.Bilgrami & H.C.Dube



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B.Sc. General (Semester Pattern)

- The evolution and classification of flowering plants – Cronquist A.
 - Woodland, D.W. (1991) – Contemporary plant systematics : Pentice Hall, New Jersey
 - Pharmacognosy – Kokate et al.
 - Herbal drug technology – Agrawal S.S. and M.Purohit
 - Encyclopedia of medicinal plants used in homoeopathy Vol-1&2 – K.S.Gopi
 - Indian medicinal plants: Forgotten healers, a guide to ayurvedic herbal medicine – Prakash Paranjape
 - Practical pharmacognosy – Khandelwar K.R.
 - Biochemical analysis – S. Sadasivam and A. Manickam
 - Pharm forestry: Field guide to medicinal plants – Dinesh kumar Tyagi
 - Modern methods of plant analysis Vol-1&2 – Peach and M.V.trecey
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- Davis P. H. and Heywood V.H. (1993) – Principles of Angiosperms Taxonomy, Tobert E. Kreigher Pub. Co. New York
 - Grant. V. (1971) – Plant Speciation – Columbia University Press New York.
 - Harrison, H.J. (1971) – New concepts in flowering plant Taxonomy – Hieman Educational Books Ltd. London
 - Heslop – Harrison J. (1967) – Plant Taxonomy- English Language Book Soc. and Edward Arnold Pub. Ltd. UK.
 - Hey wood. V.H. and Moore D.M. (1984) – Current concepts in plant Taxonomy, - Academic press, London.
 - Jones A.D. and Wilbins, A.D. (1971) – Variation and adaptations in plant, species. Hieman & Co-Educational Books Ltd. London.
 - Jones S.B. Jr. and Luchsinger, A.E. (1986) – Plant systmatics (2nd edition), Mc Graw Hill Book Co., New York.
 - Nordenstam, B.EL Gazaly, G. and Kassas, M. Zooo – Plant systematic for 21st Century. Portland press Ltd. London.
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| • A manual of laboratory experiments in cell biology | C Edward Gasque | Universal book Stall, New Delhi. |
| • An Introduction to Microbiology | P. Tauro, K.K. Kapoor, K S Yadav | Wiley Eastrevn Limited, New Delhi. |
| • Applied Microbiology | Vinita Kale, Kishore Bhusari | Himalaya publishing House, Mumbai. |
| • Biochemical methods 2 nd ed. | S. Sadasivam, A. Manickam. | New Age International Publisher (P) Ltd, New Delhi. |



SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

- Biotechniques Theory and Practice S Y S Rana Rastogi Publications, Meerat 250002
- Experiments in Microbiology, Plant Pathology and Tissue Culture K.R. Aneja, Wishwa Prakashan, New Delhi.
- Frontiers in Applied Microbiology K.G. Mukerji, N C Pathak, Vedpal Sing Print Hall, Lucknow
- Industrial Microbiology Richard W Thomas Dowden, Hutchinson & Ross Inc. Stroudtiury Penasytuna.

- Instrumental Methods of Chemical Analysis 5th Ed. Galen W Ewing. Mc Graw Hill International
- Microbial Genetics Stanley R Maloy, John E. Cronan Narosa Publishing House, New Delhi.
- Modern experimental biochemistry 3rd ed. David Freitelder Rodney Boyer Pearson education Inc.
- Plant tissue culture Kalyan Kumar DC New Central Book Agency (P) Ltd. Calcutta 700009.

- Practical Microscopy Martin and Johnsen Blackie and Sen Limited, London
- Research Experiences in plant physiology.-A Laboratory Manual Thomas C. Moore Spinger-Verlag,Berlin.

- Biophysical Chemistry. M. Sataske, Y. Hayashi, M.S. Sethi, S A Iqbal, Galen W Ewing. Discovery Publishing House (1997) New Delhi – 110002. Mc Graw Hill International
- Instrumental Methods of Chemical Analysis 5th Ed. Galen W Ewing. Mc Graw Hill International
- Practical Microbiology. R. C. Dubey, D K Maheshwari S Chand and company Ltd. New Delhi
- A manual of laboratory experiments in cell biology C Edward Gasque Universal book Stall, New Delhi.

- An Introduction to Microbiology P. Tauro, K.K. Kapoor, K S Yadav Wiley Eastrevn Limited, New Delhi.
- Applied Microbiology Vinita Kale, Kishore Bhusari Himalaya publishing Hourse, Mumbai.
- Biochemical methods 2nd ed. S. Sadasivam, A. Manickam. New Age International Publisher (P) Ltd, New Delhi.

- Biotechniques Theory and Practice S Y S Rana Rastogi Publications, Meerat 250002
- Experiments in Microbiology, Plant Pathology and Tissue Culture K.R. Aneja, Wishwa Prakashan, New Delhi.
- Frontiers in Applied Microbiology K.G. Mukerji, N C Pathak, Vedpal Sing Print Hall, Lucknow
- Industrial Microbiology Richard W Thomas Dowden, Hutchinson & Ross Inc. Stroudtiury Penasytuna.

- Microbial Genetics Stanley R Maloy, John E. Cronan Narosa Publishing House, New Delhi. David Freitelder



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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

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|---|--|--|---|
| • | Modern experimental biochemistry
3 rd ed. | Rodney Boyer | Pearson education Inc. |
| • | Plant tissue culture | Kalyan Kumar DC | New Central Book Agency (P)
Ltd. Calcutta 700009. |
| • | Practical Microscopy | Martin and Johnsen | Blackie and Sen Limited,
London |
| • | Research Experiences in plant
physiology.-A Laboratory Manual | Thomas C. Moore | Spinger-Verlag,Berlin. |
| | | | |
| • | Molecular Biology of Gene | J.D. Watson
T.A. Baker
S.P. Bell
Alexander Gann
Michael Levine
Richard Losick | Pearson Education
Singapore, Pvt.Ltd.
Indiam Branch
482 FIE Patporganj
Delhi 110 092. |
| • | Genes – Vol. V, VI & VII | Benjamin Lewin | Oxford University
Press New York. |
| • | Basic Human Genetics | Elaine Johansen
Mange & Arthur
Mange | Rastogi Publication.
Shivaji Raod, Meerut. |
| • | Principles of Genetics | E.J. Gardner,
M.J. Simmons
D.P. Snastad | John Willy and Sons
Ansari Road, Daryaganj.
New Delhi. 110 002. |
| • | Genetics Vol. I & II | C.B. Powar | Himalaya Publication
New Delhi. |
| • | Genetics | B.D. Singh | Kalyani Publishers
B-1/1292, Rajander
Nagar,
Ludhiana – 141 008. |
| • | Genetics | P.K. Gupta | Rastogi Publication,
Shivaji Raoad,
Meerut – 250 002. |
| • | Genetics Analysis &
Principles | Robert J. Brooker | Addison Wesley
Longman Inc.
New York. |
| • | Molecular Genetics | Gunther S. Stent
Richard Calendar | CBS Publishers
Distributors – 4596/1-A
DaryaGanj,
New Delhi. – 110 002. |
| • | Text Book of Molecular Biology | K.Sivarama Sastry
G. Padmanaban
C. Subramanayam | MacMillan India Ltd.
Delhi. |



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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

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|--|--|--|
| • Cell Biology, Genetics,
Molecular Biology,
Evolution and Ecology | P.S. Verma
V.K. Agarwal | S. Chand Publisher
New Delhi. |
| • Cytology Genetics & Evolution. | P.K. Gupta | Rastogi Publication,
Meerut. |
| • Cell Structure and Function | Ariel. G. Loewy
Philip Siekevitz
Arthur Giese | Oxford & IBH Publishing
Cor. Pvt. Ltd., Delhi.
W.B. Saunders Company,
London. |
| • Cell Physiology | E.J. Ambrose
Dorothy M. Easty
S. Sundara Rajan | Vikas Publication,
Bombay.
Vikas Publishing House
Pvt. Ltd. Delhi. |
| • Cell Biology | C. B. Powar | Himalaya Publishing
House. Delhi |
| • Cell Biology | Johnson Lewys | Sarup & Sons
New Delhi. – 110 002. |
| • Genetic Engineering | Sandhya Mitra | Mac. Millan India,
Ltd. New Delhi |
| • Cytology | P.S. Verma
V.K. Agarwal | S. Chand
New Delhi. |
| • The Living Cell | Donald Kennedy | W.H. Freeman and
Company,
San Francisco. |
| • The Science of Genetics | William Hexter
H.T. Yost | Prentice-Hall of India
India Pvt. Ltd.
New Delhi |
| • Studies on Genetics | H.J. Muller | Oxford & IBH Publisher
New Delhi. |
| • Genetics | A.M. Winchester | Oxford & IBH Publisher
New Delhi. |
| • Genetics | B. Guttman,
a. Griffiths
d. Suzuki
t. Cullis. | Oxford Publisher England,
London |
| • Fundamentals of Genetics | M.P. Arora | Himalaya Publishing
House. Delhi. |
| • The Biology of Cells | Herbert Sterm
David L. Nanney | Wiley Eastern
Pvt. Ltd. New Delhi |



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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

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|---|--|---|
| • Genetic Engineering & its Application. | P. Joshi | Agrobios India Ltd. |
| • Cell and Molecular Biology | S.C. Rastogi | New Age International Publisher. New Delhi. |
| • Cell Biology, Fundamentals and Applications | M.L. Gupta
M.L. Jangir | Student Edition India Ltd. , Jodhpur. |
| • Molecular Biology of Gene | J.D. Watson
T.A. Baker
S.P. Bell
Alexander Gann
Michael Levine
Richard Losick | Pearson Education
Singapore, Pvt.Ltd.
Indiam Branch
482 FIE Patporganj
Delhi 110 092. |
| • Genes – Vol. V, VI & VII | Benjamin Lewin | Oxfor University
Press New York. |
| • Basic Human Genetics | Elaine Johansen
Mange & Arthur
Mange | Rastogi Publication.
Shivaji Raod, Meerut. |
| • Principles of Genetics | E.J. Gardner,
M.J. Simmons
D.P. Snastad | John Willy and Sons
Ansari Road, Daryaganj.
New Delhi. 110 002. |
| • Genetics Vol. I & II | C.B. Powar | Himalaya Publication
New Delhi. |
| • Genticis | B.D. Singh | Kalyani Publishers
B-1/1292, Rajander
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Ludhiana – 141 008. |
| • Genetics | P.K. Gupta | Rastogi Publication,
Shivaji Raoad,
Meerut – 250 002. |
| • Genetics Analysis & Principles | Robert J. Brooker | Addison Wesley
Longman Inc.
New York. |
| • Molecular Genetics | Gunther S. Stent
Richard Calendar | CBS Publishers
Distributors – 4596/1-A
DaryaGanj,
New Delhi. – 110 002. |
| • Text Book of Molecular Biology | K.Sivarama Sastry
G. Padmanaban
C. Subramanayam | MacMillan India Ltd.
Delhi. |
| • Cell Biology, Genetics,
Molecular Biology, | P.S. Verma
V.K. Agarwal | S. Chand Publisher
New Delhi. |



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BOTANY – CURRICULUM

B.Sc. General (Semester Pattern)

Evolution and Ecology

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|---|--|--|
| • Cytology Genetics & Evolution. | P.K. Gupta | Rastogi Publication,
Meerut. |
| • Cell Structure and Function | Ariel. G. Loewy | Oxford & IBH Publishing
Cor. Pvt. Ltd., Delhi. |
| • Cell Physiology | Philip Siekevitz | W.B. Saunders Company,
London. |
| • Cell Biology | Arthur Giese | Vikas Publication,
Bombay. |
| • Introduction to Cell Biology | E.J. Ambrose | Vikas Publishing House
Pvt. Ltd. Delhi. |
| • Cell Biology | Dorothy M. Easty | Himalaya Publishing
House. Delhi |
| • Cell Biology | S.Sundara Rajan | Sarup & Sons
New Delhi. – 110 002. |
| • Genetic Engineering | C. B. Powar | Mac. Millan India,
Ltd. New Delhi |
| • Cytology | Johnson Lewys | S.Chand
New Delhi. |
| • The Living Cell | Sandhya Mitra | W.H. Freeman and
Company,
Sanfrancisco. |
| • The Science of Genetics | P.S. Verma | Prentics-Hall of India
India Pvt. Ltd.
New Delhi |
| • Studies on Genetics | V.K. Agarwal | Oxford & IBH Publisher
New Delhi. |
| • Genetics | Donald Kennedy | Oxford & IBH Publisher
New Delhi. |
| • Genetics | William Hexter | Oxford Publisher England,
London |
| • Genetics | H.T. Yost | |
| • Fundamentals of Genetics | H.J. Muller | |
| • The Biology of Cells | A.M. Winchester | |
| • Genetic Engineering & its
Application. | B. guttman,
a. Griffiths
d. Suzuki
t. Cullis. | |
| | M.P. Arora | Himalaya Publishing
House. Delhi. |
| | Herbert Sterm
David L. Nanney | Willey Eastern
Pvt. Ltd. New Delhi |
| | P. Joshi | Agrobios India Ltd. |

