



॥ सा विद्या या विमुक्तये ॥

# स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड - ४३१ ६०६ (महाराष्ट्र राज्य) भारत

## SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

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प्रस्तुत विद्यापीठाच्या सलग्नित महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील B. Sc. Botany III year पदवी स्तरावरील CBCS Pattern नुसारचा Revised अभ्यासक्रम शैक्षणिक वर्ष २०२१-२२ पासून लागू करण्याबाबत.

### प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या सलग्नित महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील B. Sc. Botany III year या पदवी स्तरावरील CBCS Pattern नुसारचा Revised अभ्यासक्रम शैक्षणिक वर्ष २०२१-२२ पासून लागू करण्याच्या दृष्टीन मा. कुलगुरू महोदयांनी मा. विद्यापरिषदेच्या मान्यतेच्या अधीन राहून अभ्यासक्रमास मान्यता दिलेली आहे.

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या [www.srtmun.ac.in](http://www.srtmun.ac.in) या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,

विष्णुपुरी, नांदेड - ४३१ ६०६.

जा.क्र.:शैक्षणिक-१ / परिपत्रक/पदवी-अभ्यासक्रम /

न्यू मॉडल डिग्री कालेज/ २०२१-२२/१७५

दिनांक : २३.१०.२०२१.

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
- २) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ३) मा. प्राचार्य, संबंधित सलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
- ४) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
- ५) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
- ६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना देवून कळविण्यात येते की, सदरील परिपत्रक व अभ्यासक्रम विद्यापीठ संकेतस्थळावर प्रसिध्द करण्यात यावे.



स्वाक्षरित

सहा.कुलसचिव

शैक्षणिक (१-अभ्यासमंडळ) विभाग



**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
Semester Pattern Curriculum Under CBCS For  
Faculty of Science & Technology, Under Graduate (UG) Programme  
**CLASS: B. Sc. THIRD YEAR, SUBJECT: BOTANY**

**B. Sc. THIRD YEAR  
BOTANY-CURRICULUM  
Revised- 2021-2022**

**WITH EFFECT FROM JUNE-2021**



### **INTRODUCTION:**

The SRTMUN is gearing up for several initiatives towards academic excellence, quality improvement and administrative reforms. In view of this priority and in keeping with Vision and Mission, process was already initiated towards introduction of semester system, grading system and credit system. In the recent past, University had already implemented Credit based grading system to campus schools and Choice Based Credit System (CBCS) pattern for PG in all the affiliated colleges from the academic year 2014-2015. These regulations shall be called as Choice Based Course Credit System & Grading, 2014. In short it will be referred as SRTMUN CBCS REGULATION. Similarly university had implemented Choice Based Credit System (CBCS) pattern at UG level from the academic year 2016-2017 progressively (for B.Sc. first year from 2016-2017, for B.Sc. second year form 2017-2018 and for B.Sc. third year from 2018-2019 respectively).

Revision and updating of the curriculum is the continuous process to provide an updated education to the students at large. In view of this priority and in keeping with vision and mission, process of revision and updating the curriculum is initiated and implemented at UG level from the academic year **2019-2020** progressively (for B.Sc. first year from **2019-2020**, for B.Sc. second year form **2020-2021** and for B.Sc. third year from **2021-2022** respectively). Presently there is 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 as per the SRTMUN CBCS REGULATION, curriculum of different Indian Universities, syllabus of NET, SET, MPSC, UPSC, Forest Services and the UGC model curriculum are referred to serve as a base in updating the same.

The B.Sc. Botany (General) semester pattern course is running in different affiliated colleges of the SRTMUN. The course content has been designed under CBCS pattern. The course content of each theory paper is divided into units by giving appropriate titles and subtitles. For each unit, total number of periods required is mentioned. A list of practical exercises and skills for laboratory work to be completed in the academic year is also given. A common skeleton question paper for all the courses is also provided at the end of the syllabus.

### **SALIENT FEATURES:**

The syllabus of B.Sc. Third year Botany has been framed to meet the requirement of Choice based Credit System. The courses offered herein will train and orient the students in the field of Botany.

The DSCB-I deals with cell and molecular biology and DSCB-II deals with the genetics and plant breeding. The DSCBP-I deals with practicals on cell biology, molecular biology, genetics and plant breeding. This would help students to lay a strong foundation in the field of cell biology, molecular biology, genetics and plant breeding. The DECB-I&II deals with the study of different fields such as plant pathology, systematic botany and herbal technology. The DECBP-I deals with practicals based on plant pathology, systematic botany and herbal technology. This would help students to lay a strong foundation in the field of plant pathology, systematic botany and herbal technology. Overall after completion of this course, students will acquire detail fundamental knowledge in plant pathology, systematic botany



and herbal technology. Discipline Specific Courses and Discipline Specific Elective Courses offered during this program are designed with the aim of imparting specific practical knowledge to the students which will lead to self employability through development of their own enterprises.

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs):**

**PEO1:** To impart the knowledge to the students in the field of Cell Biology, Molecular Biology, Plant Breeding, Plant Pathology, Systematic Botany, Herbal Technology and Other fields of Botany.

**PEO2:** To update curriculum by introducing recent advances in the subject and enable the students to face NET, SET, UPSC and other competitive examinations successfully.

**PEO3:** To develop laboratory skills in the students that will be helpful for identification of species, diseases and their management.

**PEO4:** To train and orient the students so as to develop human resource for the educational institutes, industries and other organizations.

**PEO5:** To develop specific skills amongst students for self-employability through the development of their own enterprises.

**PEO6:** To develop ability for the application of the acquired knowledge in the fields of life so as to make our country self-reliant and self-sufficient.

**PROGRAM OUTCOMES (POs):**

**PO1:** This program will train and orient the students in the field of Cell Biology, Molecular Biology, Plant Breeding, Plant Pathology, Systematic Botany, Herbal Technology and Other fields of Botany.

**PO2:** This will provide updated curriculum with recent advances in the subject and enable the students to face NET, SET, UPSC and other competitive examinations successfully.

**PO3:** Students shall be able to identify different plant species, plant diseases and shall be able to do their management.

**PO4:** This program shall train and orient the students so as to develop human resource for the educational institutes, industries and other organizations.

**PO5:** This will also develop specific skills amongst students for self-employability through the development of their own enterprises.

**PO6:** This shall develop ability in the students for the application of the acquired knowledge in the fields of life so as to make our country self-reliant and self-sufficient.

**PREREQUISITE:**

The optional courses are offered to the students registered for undergraduate programs. Such students should have the basic knowledge of biological science and willing to gain additional knowledge in the field of Botany.

Admissions to B. Sc. Program are given as per the University rules.



**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

Semester Pattern Curriculum Under CBCS For

Faculty of Science & Technology, Under Graduate (UG) Programme

**CLASS: B. Sc. THIRD YEAR, SUBJECT: BOTANY**

**An outline:**

Semester/ Annual Pattern	Course No.	Course Name	Instruction Hrs/week	Total Periods	Marks for		Credits (Marks)
					Internal (MSA)	External (ESA)	
Semester-V	DSCB-I	<b>DSCB-I:</b> Cell and Molecular biology (Theory Paper-XII)	03	45	10	40	Credits: 02 (Marks:50)
	DECB-I	<b>DECB-I:</b> Plant Pathology-I (Theory Paper-XIII) <b>OR</b> <b>DECB-I:</b> Systematic Botany-I (Theory Paper-XIII) <b>OR</b> <b>DECB-I:</b> Herbal Technology-I (Theory Paper-XIII)	03	45	10	40	Credits: 02 (Marks:50)
Semester-VI	DSCB-II	<b>DSCB-II:</b> Genetics and Plant Breeding (Theory Paper-XIV)	03	45	10	40	Credits: 02 (Marks:50)
	DECB-II	<b>DECB-II:</b> Plant Pathology-II (Theory Paper-XV) <b>OR</b> <b>DECB-II:</b> Systematic Botany-II (Theory Paper-XV) <b>OR</b> <b>DECB-II:</b> Herbal Technology-II (Theory Paper-XV)	03	45	10	40	Credits: 02 (Marks:50)
Annual Pattern	DSCBP-I	<b>DSCBP-I:</b> Practicals based on DSCB-I & II (Practical Paper-XVI)	03	16 Practicals/Batch/ Year	10	40	Credits: 02 (Marks:50)
	SECB-III	<b>SECB-III:</b> Trichoderma Cultivation Technology <b>OR</b> <b>SEC-III:</b> Medicinal Plant Product Preparation Skill	03	45 (Theory periods- 21/Year, Practicals- 08/year)	25	25	Credits: 02 (Marks:50)
Annual Pattern	DECBP-I	<b>DECBP-I:</b> Practicals based on DECB-I & II (Practical Paper-XVII)	03	16 Practicals/Batch/ Year	10	40	Credits: 02 (Marks:50)
	SECB-IV	<b>SECB-IV:</b> Mushroom Cultivation <b>OR</b> <b>SECB-IV:</b> Herbal Drug Processing	03	45 (Theory periods- 21/Year, Practicals- 08/year)	25	25	Credits: 02 (Marks:50)
Total Marks & Credits Semester-V and VI					Marks: 110	Marks: 290	Credits: 16 Marks:400

(**DSCB:** Discipline Specific Course in Botany, **DSCBP:** Discipline Specific Course in Botany Practicals, **DECB:** Discipline Elective Course in Botany, **DECBP:** Discipline Elective Course in Botany Practicals, **MSA:** Mid Semester Assessment, **ESA:** End Semester Assessment)

**SECB:** Skill Enhancement Course in Botany,

**Distribution of credits (80% of the total credits for ESA and 20% for MSA):**

**MSA of 10 Marks (Theory):** 05 marks for Test and 05 marks for home assignment

**MSA of 10 Marks (Practical):** 05 marks for Test and 05 marks for Record book & submissions

(Excursion report, collected plant material, keys, models etc.)

**MSA of Marks 25:** 15 for marks Seminar & 10 marks for Test)



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**CLASS: B. Sc. THIRD YEAR, SUBJECT: BOTANY**

**SEMESTER-V**

**DISCIPLINE SPECIFIC COURSE IN BOTANY-DSCB** (A Theory Course)

**DSCB-I: Cell and Molecular Biology (Theory Paper-XII)**

**DISCIPLINE ELECTIVE COURSE IN BOTANY-DECB** (A Theory Course)

**DECB-I: Plant Pathology-I (Theory Paper-XIII)**

**OR**

**DECB-I: Systematic Botany-I (Theory Paper-XIII)**

**OR**

**DECB-I: Herbal Technology-I (Theory Paper-XIII)**

Periods: 45

Credits: 02 (Maximum Marks: 50)

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**SEMESTER-V**

**DSCB-I: CELL AND MOLECULAR BIOLOGY**

(Theory Paper-XII)

**Learning Objectives:**

1. To know about the ultra structure of a cell, cell wall, cell membrane, cell organelles and chromosomes, cell cycle and cell division.
2. To study in detail the structure of DNA and RNA, protein synthesis, gene structure, gene mutation and related diseases.
3. To acquire knowledge of cell and molecular biology

**Learning Outcomes:**

1. The students will be able to understand ultra structure of a cell, cell wall, cell membrane, cell organelles and chromosomes, cell cycle and cell division.
2. The students will be able to understand in detail the structure of DNA and RNA, protein synthesis, gene structure, gene mutation and related diseases.
3. Students will acquire knowledge of cell and molecular biology

**UNIT-I: CELL BIOLOGY-I** (11 Periods)

1. Cell: the unit of life, ultra structure of Prokaryotic and eukaryotic cells, 2. Ultra structure and functions of cell wall and cell membranes (Fluid Mosaic Model), 3. Ultra Structure and functions of cell organelles: Golgi apparatus, Endoplasmic reticulum, Ribosomes, Lysosomes, Peroxisomes, Glyoxisomes and Nucleus.

**UNIT-II: CELL BIOLOGY-II** (12 Periods)

1. Chromosome: Morphology, structure and function of typical chromosome and Karyotype and Idiogram, 2. Structure and significance of giant Chromosomes: Polytene chromosome and Lampbrush chromosome, 3. 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-I** (11 Periods)

1. Nucleic Acids- Introduction, Chemical composition, Structure of DNA (Watson and Crick model), Replication of DNA Meselson and Stahl expt.), Structure,



function and types of RNA. 2. Protein synthesis: Genetic code (Nature and Properties), Transcription, Translation.

**UNIT-IV: MOLECULAR BIOLOGY-II (11 Periods)**

1. Classical concept of gene (theory of Morgan), Fine structure of gene (Seymour Benzer's), Regulation of gene expression in prokaryotes (Lac Operon Model) 2. Mutation: Introduction, Mutagens, Molecular basis of gene mutation and related diseases: Phenylketonuria (PKU), Alkaptonuria (AKU), Albinism, Sickle cell anaemia and Amniocentesis (Detection of genetic diseases).

**Theory Paper-XII: Cell and Molecular Biology**

(Unit Wise Distribution of Periods and maximum marks)

Unit	Title of the unit	Periods Distributed	Maximum Marks
Unit-I	Cell biology-I	11	20
Unit-II	Cell biology-II	12	20
Unit-III	Molecular biology-I	11	20
Unit-IV	Molecular biology-II	11	20
<b>Total</b>		<b>45</b>	<b>80</b>

**SEMESTER-V**

**DECB-I: PLANT PATHOLOGY-I**

(Theory Paper-XIII)

**Learning Objectives:**

1. To know about the fundamentals of plant pathology.
2. To study in detail the process of plant disease development.
3. To acquire knowledge of different plant diseases in different plants.

**Learning Outcomes:**

1. The students will be able to understand fundamentals of plant pathology.
2. The students will be able to understand in detail the process of plant disease development.
3. Students will acquire knowledge of different plant diseases in different plants.

**UNIT-I: FUNDAMENTALS OF PLANT PATHOLOGY (11 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 techniques, Koch's postulates for pathogenicity.

**UNIT-II: PLANT DISEASE DEVELOPMENT (11 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), Chemical weapons of pathogen: Role of cell wall degrading enzymes and Mycotoxins in pathogenesis.



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

Symptoms, causal organisms, disease cycle and control measures of Green ear of Bajra, early blight of tomato, Grain smut of Jowar, Red rot of Sugarcane, Angular leaf spot of cotton, Bacterial blight of Pomegranate, Anthracnose of mango

**UNIT-IV: PLANT DISEASES-II** (11 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*), Sigatoka disease of Banana, Brown leaf spot of Rice.

**Theory Paper-XIII: Plant Pathology-I**

(Unit Wise Distribution of Periods and maximum marks)

Unit	Title	Period Allotted	Maximum Marks
Unit-I	Fundamentals of Plant Pathology	11	20
Unit-II	Plant Disease Development	11	20
Unit-III	Plant Diseases-I	12	20
Unit-IV	Plant Diseases-II	11	20
<b>Total</b>		<b>45</b>	<b>80</b>

**OR**

**SEMESTER-V**

**DECB-I: SYSTEMATIC BOTANY-I**

(Theory Paper-XIII)

**Learning Objectives:**

1. To know about the fundamentals of plant classification.
2. To study in detail the principles of plant taxonomy.
3. To acquire knowledge of different families of polypetalae, gamopetalae and apetalae.

**Learning Outcomes:**

1. The students will be able to understand fundamentals of classification of angiosperms.
2. The students will be able to understand in detail the principles of plant taxonomy.
3. Students will acquire knowledge of different families of polypetalae, gamopetalae and apetalae.

**UNIT-I: CLASSIFICATION** (11 periods)

Introduction: Definition, aims, scope and application of angiosperms taxonomy, Types of classification-Artificial, Natural and Phylogenetic with reference to Linnaeus, Bentham & Hooker and Robert Thorne's classification (Outline of classification is expected ) of angiosperms with merits and demerits respectively.

**UNIT -II: TAXONOMIC TOOLS** (10 periods)

Herbarium- Techniques of plant preservation, Importance of herbarium, Botanical gardens -Role in plant taxonomy, Important Botanical gardens, Plant identification key-Types and use. Flora, Monographs, Numerical Taxonomy, Molecular Systematics.



**UNIT-III: FAMILIES OF POLYPETALAE** (12 periods)

Study of Family-Papaveraceae, Cucurbitaceae, Malvaceae, Meliaceae, Caesalpinaceae, Combretaceae according to Bentham and Hooker's system of classification with reference to general characters, pollination, floral formula, floral diagram, systematic position, distinguishing features and economic importance

**UNIT -IV: FAMILIES OF GAMOPETALAE AND APETALAE** (12 periods)

Study of Family-Rubiaceae, Apocynaceae, Convolvulaceae, Bignoniaceae, Verbenaceae and Nyctaginaceae according to Bentham and Hooker's system of classification with reference to general characters, pollination, floral formula, floral diagram, systematic position, distinguishing features and economic importance

**Theory Paper-XIII: Systematic Botany-I**

(Unit Wise Distribution of Periods and maximum marks)

Unit	Title	Period Allotted	Maximum Marks
Unit-I	Classification	11	20
Unit-II	Taxonomic tools	10	20
Unit-III	Families of Polypetalae	12	20
Unit-IV	Families of Gamopetalae and Apetalae	12	20
<b>Total</b>		<b>45</b>	<b>80</b>

**OR**

**SEMESTER-V**

**DECB-I: HERBAL TECHNOLOGY-I**

(Theory Paper-XIII)

**Learning Objectives:**

1. To know about the fundamentals of medicinal and aromatic plants.
2. To study in detail the principles of crude plant drugs and pharmacognosy.
3. To acquire knowledge of standardization of drugs.

**Learning Outcomes:**

1. The students will be able to understand fundamentals of medicinal and aromatic plants.
2. The students will be able to understand in detail the crude plant drugs and pharmacognosy.
3. Students will acquire knowledge of standardization of drugs.

**UNIT-I: MEDICINAL AND AROMATIC PLANTS (MAP)** (11 periods)

Introduction, History, importance, demand and supply of MAP in India, Indian systems of medicine- Ayurvedic, Unani, homeopathic, siddha, yoga and naturopathy, tribal medicine sources, Herbal sources, Animal sources, Mineral sources, their collection, purification and processing.



**UNIT-II: CRUDE PLANT DRUGS** (11 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 plant drugs, Unorganized drugs- Gums, Mucilage, resins, dried juices, latex and extracts. Structure, types and importance of stomata and trichomes

**UNIT-III: PHARMACOGNOTIC STUDIES** (11 periods)

Distribution, morphology, anatomical, chemical constituents and uses of Root drugs- Shatavari, Ashwagandha, Stem drugs- Ginger, turmeric, Gulvel, Chandan, Leaf drugs- Adulsa, Korphad (Aloe), Fruit drugs- Behda, Hirda and Entire plant drugs- Tulsi and Aghada

**UNIT-IV: MEDICINAL PLANT BIOTECHNOLOGY AND STANDARDIZATION OF DRUGS** (12periods)

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. Tissue culture of medicinal important plants, secondary metabolites production (Alkaloids, Flavonoids)

**Theory Paper-XIII: Herbal Technology-I**

(Unit Wise Distribution of Periods and maximum marks)

Unit	Title	Period Allotted	Maximum Marks
Unit-I	Medicinal and aromatic plants	11	20
Unit-II	Crude plant drugs	11	20
Unit-III	Pharmacognocny	11	20
Unit-IV	Drug standardization	12	20
<b>Total</b>		<b>45</b>	<b>80</b>

**SEMESTER-VI**

**DESCIPLINE SPECIFIC COURSE IN BOTANY-DSCB** (A Theory Course)

**DSCB-I:** Genetics and Plant Breeding (Theory Paper-XIV)

**DESCIPLINE ELECTIVE COURSE IN BOTANY-DECB** (A Theory Course)

**DECB-I:** Plant Pathology-II (Theory Paper-XV)

**OR**

**DECB-I:** Systematic Botany-II (Theory Paper-XV)

**OR**

**DECB-I:** Herbal Technology-II (Theory Paper-XV)

Periods: 45

Credits: 02 (Maximum Marks: 50)



**SEMESTER-VI**

**DSCB-I: GENETICS AND PLANT BREEDING**

(Theory Paper-XIV)

**Learning Objectives:**

1. To study Mendelian genetics, gene interaction.
2. To study sex determination, linkage, sex linked inheritance and genetic variations.
3. To study various crop improvement methods in plant breeding.

**Learning Outcomes:** Students shall

1. Understand Mendelian genetics, gene interaction.
2. Learn the sex determination, linkage, sex linked inheritance and genetic variations.
3. Understand various crop improvement methods in plant breeding.

**UNIT-I: GENETICS-I** (11 Periods)

1. Mendelian inheritance: Mendel's Laws of inheritance. Explanation and examples of Monohybrid cross, dihybrid cross (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) 3. Sex determination: Discovery of sex chromosomes, chromosomal theory of sex determination, sex determination in insects (XO-XX), Birds (ZW-ZZ method), Animals (Drosophila and Man), and Plants (*Melandrium* and *Asparagus*).

**UNIT -II: GENETICS-II** (12 Periods)

1. Linkage: (Definitions and significance) Coupling and repulsion hypothesis. Type of linkage (maize and drosophila) 2. Sex linked inheritance: Definition classification (x-linked, y-linked and xy-linked), Sex linked inheritance in Drosophila (white eye colour), Man (Hemophilia, colour blindness and holandric gene-hypertrochosis) and Birds (barred feathers) 3. Genetic variations: Polyploidy, Euploidy-Autopolyploidy and Allopolyploidy with reference to Raphanobrassica and Hexaploid wheat, Aneuploidy (Hyper and Hypoploidy), Syndromes in human i) Down's syndrome ii) Edward's syndrome iii) Patau's syndrome iv) Turner's syndrome v) Klinefelter's syndrome.

**UNIT -III: PLANT BREEDING-I** (11 Periods)

1. Introduction and objectives of plant breeding, methods of plant breeding: Selection-Mass selection, pure line selection and clonal selection, 2. Hybridization: definition, objectives, various steps in hybridization, applications, 3. Heterosis and hybrid vigour: definition, effects, utilization and limitations.

**UNIT -IV: PLANT BREEDING -II** (11 Periods)

1. Plant introduction and acclimatization, types, advantages and disadvantages, 2. Mutational breeding: objectives, procedure, applications, Mutational breeding with reference to groundnut 3. Male sterility: Genetic Male Sterility (GMS), Cytoplasmic Male Sterility (CMS).



**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
Semester Pattern Curriculum Under CBCS For  
Faculty of Science & Technology, Under Graduate (UG) Programme  
**CLASS: B. Sc. THIRD YEAR, SUBJECT: BOTANY**

**Theory Paper-XIV: Genetics and Plant Breeding**

(Unit Wise Distribution of Periods and maximum marks)

Unit	Title of the unit	Periods Distributed	Maximum Marks
Unit-I	Genetic-I	11	20
Unit-II	Genetics-II	12	20
Unit-III	Plant breeding-I	11	20
Unit-IV	Plant breeding-II	11	20
<b>Total</b>		<b>45</b>	<b>80</b>

**SEMESTER-VI**

**DECB-I: PLANT PATHOLOGY-II**

(Theory Paper-XV)

**Learning Objectives:**

1. To know about the fundamentals of aerobiology and seed pathology.
2. To study in detail the process of plant Defense mechanism and management.
3. To acquire knowledge of different plant diseases in different plants.

**Learning Outcomes:**

1. The students will be able to understand fundamentals of aerobiology and seed pathology.
2. The students will be able to understand in detail the process of plant Defense mechanism and management.
3. Students will acquire knowledge of different plant diseases in different plants.

**UNIT-I: AEROBIOLOGY AND SEED PATHOLOGY (11 periods)**

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

**UNIT-II: PLANT DEFENCE MECHANISM AND DISEASE MANAGEMENT**

(11 periods)

Structural (pre-existing and Post inflectional) and biochemical Defence-pre-existing and Post inflectional (phytoalexins), Exclusion and eradication, Chemical control-General account of Sulphur, Copper, systemic fungicides and antibiotics, Biological control

**UNIT-III: PLANT DISEASES-I (11 periods)**

Symptoms, causal organisms, disease cycle and control measures of Tikka disease of groundnut, Ergot of Bajra, Loose smut of Wheat, Rust of Jowar, Phanerogamic plant parasites (Cuscuta), Leaf curl of tomato.

**UNIT-IV: PLANT DISEASES-II (12 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 disease of Sugarcane, Papaya mosaic, Leaf Blight and Leaf Rust of Soybean and Leaf spot of cabbage.

**Theory Paper-XV: Plant Pathology-II**

(Unit Wise Distribution of Periods and maximum marks)

Unit	Title	Period Allotted	Maximum Marks
Unit-I	Aerobiology and seed pathology	11	20
Unit-II	Plant Defense mechanism and disease management	11	20
Unit-III	Plant Diseases-I	11	20
Unit-IV	Plant Diseases-II	12	20
<b>Total</b>		<b>45</b>	<b>80</b>

**OR**

**SEMESTER-VI**

**DECB-I: SYSTEMATIC BOTANY-II**

(Theory Paper-XV)

**Learning Objectives:**

1. To acquire knowledge of different families of monocotyledons
2. To know about the principles of taxonomy
3. To study in detail the origin of angiosperms

**Learning Outcomes:**

1. Students will acquire knowledge of different families of monocotyledons
2. The students will be able to understand principles of taxonomy
3. The students will be able to understand in detail the origin of angiosperms.

**UNIT-I: STUDY OF MONOCOT FAMILIES-I (12 periods)**

Study of Family-Orchidaceae, Amaryllidaceae, Musaceae, Zingiberaceae, Cannaceae and Liliaceae 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

**UNIT-II: STUDY OF MONOCOT FAMILIES-II (12 periods)**

Study of Family-Arecaceae, Typhaceae, Commelinaceae, Juncaceae, Allismaceae, Cyperaceae 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

**UNIT-III: PRINCIPLES OF TAXONOMY (11 periods)**

ICN (International Code of Nomenclature)-Brief history, principle of priority, effective and valid publication, typification and author citation, Species concept-Morphological, biological and Evolutionary, Role of phytochemistry, cytology, anatomy and palynology in relation to taxonomy, Pollen morphology with reference to pollen grains of Hibiscus, Ipomoea and Grasses



**UNIT-IV: ORIGIN OF ANGIOSPERMS (10 periods)**

Concept of speciation and its types, Place and Time of origin of angiosperms, Hemiangiosperm concept of origin, Probable ancestors of Angiosperms, Bennettitalean, Gnetalean and Pteridosperm theories regarding ancestors of angiosperms

**Theory Paper-XV: Systematic Botany-II**

(Unit Wise Distribution of Periods and maximum marks)

Unit	Title	Period Allotted	Maximum Marks
Unit-I	Study of monocot families-I	12	20
Unit-II	Study of monocot families-II	12	20
Unit-III	Principles of taxonomy	11	20
Unit-IV	Origin of angiosperms	10	20
<b>Total</b>		<b>45</b>	<b>80</b>

**OR**

**SEMESTER-VI**

**DECB-I: HERBAL TECHNOLOGY-II**

(Theory Paper-XV)

**Learning Objectives:**

1. To know about the fundamentals of herbal formulation, drug constituent and biosynthetic pathway.
2. To study in detail the principles of analytical and chromatographic techniques.
3. To acquire knowledge of different drug constituent and biosynthetic pathway.

**Learning Outcomes:**

1. The students will be able to understand fundamentals of herbal formulation, drug constituent and biosynthetic pathway.
2. The students will be able to understand in detail about the analytical and chromatographic techniques.
3. Learner will get information about drug constituents and biosynthetic pathways.

**UNIT-I: INSTRUMENTATION IN HERBAL ANALYSIS-I (12 Periods)**

Introduction: Laboratory safety, Personal protection and safety disposal. Microscopy: Working and application of simple microscope, compound microscope, Dark field microscope, fluorescence microscope, scanning and transmission electron microscope, Micrometry, Principle, working and application of Autoclave, Incubator, Oven, Laminar air flow. Differential staining technique of herbal drugs

**UNIT-II: INSTRUMENTATION IN HERBAL ANALYSIS-II (11 Periods)**

Principles and applications of spectral techniques in drug analysis: The theoretical aspects, basic instrumentation, and applications of, Colorimetry, UV-Visible spectrophotometry; Fluorimetry; Infrared spectrophotometry; Flame Photometry Principle and applications of Chromatographic



techniques in herbal analysis: paper chromatography, TLC, HPLC, HPTLC, column and GC chromatograph

**UNIT-III: HERBAL FORMULATION** (11 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. Preparation and therapeutic uses of Triphalachurna, Arjunarishtha (Aristha) Gooti, Vatti and Telam

**UNIT-IV: DRUG CONSTITUENTS AND BIOSYNTHETIC PATHWAY.**

(11 periods)

Introduction, occurrence and chemistry and Biosynthetic pathway of glycosides, alkaloids and steroids Flavonoids, Alkaloid: Reserpine, Morphin. Glycosides: Glycyrrhizin, Digitoxin. Steroids: Withanoloids. Flavonoids: Quercetin, Ritin. Carotenoids: Lycopene-carotene Cardiotonics- Digitalis, Antitumour-Vinca

**Theory Paper-XV: Herbal Technology-II**

(Unit Wise Distribution of Periods and maximum marks)

<b>Unit</b>	<b>Title</b>	<b>Period Allotted</b>	<b>Maximum Marks</b>
Unit-I	Herbal formulation	12	20
Unit-II	Drug constituents and Biosynthetic pathway	11	20
Unit-III	Analytical and Chromatographic techniques	11	20
Unit-IV	Herbal cosmetics	11	20
<b>Total</b>		<b>45</b>	<b>80</b>



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**CLASS: B. Sc. THIRD YEAR, SUBJECT: BOTANY**

Skeleton Question Paper  
End Semester Assessment (ESA)  
**SEMESTER-V&VI**  
Theory Paper-XII, XIII & XIV, XV

**Time:** 1 Hour 30 Min  
**Maximum Marks:** 40

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**Note:**

1. Attempt all questions
  2. All questions carry equal marks
  3. Draw neat and well labeled diagrams wherever necessary
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**Q1.** Long Answer Type Question (LATQ) **15 marks**

**OR**

- a. Short Answer Type Questions (SATQ) **08 marks**
- b. Short Answer Type Question (SATQ) **07 marks**

(This question will be based on any two units with equal weightages to each unit)

**Q2.** Long Answer Type Question (LATQ) **15 marks**

**OR**

- a. Short Answer Type Question (SATQ) **08 marks**
- b. Short Answer Type Question (SATQ) **07 marks**

(This question will be based on remaining two units with equal weightages to each unit excluding the units used for Q1.)

**Q3.** Attempt any two of the four **10 marks**

- a. Short note Type Question (SNTQ) 05 marks
- b. Short note Type Question (SNTQ) 05 marks
- c. Short note Type Question (SNTQ) 05 marks
- d. Short note Type Question (SNTQ) 05 marks

(This question will be based on all the four units of the entire syllabus)

**Note:** The question paper pattern would be subject to directives of the University from time to time.



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**PRACTICAL COURSES**

**DSCBP-I:** Practicals based on theory paper-XII&XIV-Cell and molecular biology & Genetics and plant breeding  
**(Practical paper-XVI)**

**DECBP-I:** Practicals based on theory paper-XIII&XV-Plant Pathology-I&II  
**(Practical paper-XVII)**

OR

**DECBP-I:** Practicals based on theory paper-XIII&XV-Systematic Botany-I&II  
**(Practical paper-XVII)**

OR

**DECBP-I:** Practicals based on theory paper-XIII&XV-Herbal drug Technology-I&II  
**(Practical paper-XVII)**

**Practicals: 16**

**Credits: 02 (Maximum Marks: 50)**

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Annual Pattern

**DSCBP-I**

**Practical paper-XVI: Practicals based on theory paper-XII&XIV**  
(Cell and molecular Biology & Genetics and Plant Breeding)

**Learning Objectives:**

1. To study Cell biology.
2. To study Molecular biology
3. To study Genetics and plant breeding.

**Learning Outcomes:** Students shall

1. Understand Cell biology
2. Learn the molecular biology
3. Understand genetics and plant breeding

**Practical Exercises:**

1. Study of ultra-structure of cell organelles with the help of photocopies/slides (**1Practical**)
2. Study of giant chromosome with the help of photocopies/ slides (**1Practical**)
3. Study of Salivary gland chromosome from *Chironomous* larvae (**1Practical**)
4. Cell division-study of mitosis (Onion/Garlic root tips or any other available material) and mitotic index (**6 Practicals**)
5. Study of karyotype and idiogram from photocopies of Onion/ Aloe plant material (**1 Practical**)
6. Cell division-study of meiosis from Onion/Maize floral buds or any other available material (**6 Practicals**)
7. Problems based on Monohybrid/Dihybrid ratio; 9:7/9:3:4/12:3:1/15:1 ratios and collaborator gene (**6 Practicals**)
8. Problems based on sex-linked inheritance (**4 Practicals**)
9. Study of syndromes in Man by using photocopies (**1Practical**)



10. Perform hybridization techniques-Emasculation, Pollination and Bagging (**1 Practical**)
11. Study of floral structure of self-pollinated (wheat) and cross pollinated (Maize) crops (**1 Practical**)
12. Pollen viability tests- Acetocarmine method and Sugar solution method (**1 Practical**)
13. Botanical excursions- At least one long and several local excursions are expected.
14. Preparation of wool models of mitosis and meiosis is expected

**Note:**

1. Minimum 16 practicals are expected to be completed during the academic year.
2. The submission of practical record book, excursion report, wool models, slides etc. are expected for MSA during the academic year. The MSA carries marks.

Skeleton Question Paper  
End Semester Assessment (ESA)

**DSCBP-I**

**Practical paper-XVI:** Practicals based on theory paper-XII&XIV  
**(Cell and molecular Biology & Genetics and Plant Breeding)**

**Time:** Four hours  
**Maximum Marks:** 40

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**Note:**

1. Attempt all questions
  2. All questions carry equal marks
  3. Draw neat and well labeled diagrams wherever necessary
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**Q1.** Prepare a temporary squash/smear of the given material-**A**. Identify and describe any two stages of Mitosis/Meiosis (08)

**Q2.** Calculate the Mitotic index from the given material-**B** (06)  
OR

Prepare a karyotype from the given photocopy-**C**

**Q3.** Solve the problem- Any Two (12)

(Based on Dihybrid ratio/Gene interactions/ Collaborator Gene/ Sex linked inheritance)

**Q4.** Perform the process of emasculation of the given flower (04)

**Q5.** Identify and describe in brief the given Spot-**D, E & F** (06)

(Spot-D based on Cell organelles, Spot-E based on Giant chromosome/Chromosome-SAT/Centromere, Spot-F based on Syndromes)

**Q6.** Viva-Voce (04)



Annual Pattern

**DECBP-I**

**Practical paper-XVII: Practicals based on theory paper-XIII&XV  
(Plant Pathology-I&II)**

**Learning Objectives:**

1. To study different laboratory equipments and micrometry
2. To study in detail the pathogenicity, symptoms and causal organisms of plant diseases, effect of temperature and pH on plant pathogens.
3. To acquire knowledge of culture media, isolation and identification of pathogens from diseased plant parts and from air.

**Learning Outcomes:**

1. The students will be able to understand working operating of laboratory equipments.
2. The students will be able to understand in detail the pathogenicity, symptoms and causal organisms of plant diseases, effect of temperature and pH on plant pathogens.
3. Students will acquire knowledge of different culture media, isolation and identification of pathogens from diseased plant parts and from air.

**Practical Exercises:**

1. Study of laboratory equipments-Autoclave, Hot air oven, inoculating chamber, laminar air flow, Air sampler, Incubator, Centrifuge (**2 practical**)
2. Preparation of culture media-PDA, NA (**2 practical**)
3. Micrometry-Calibration of microscope and measurement of fungal spores (**2 practical**)
4. Isolation of fungal pathogens from diseased plant parts, Toxins & Enzymes (**2 practical**)
5. Isolation and identification of seed-borne pathogen by blotter / agar plate method (**2 practical**)
6. Study of air-borne pathogen by exposed Petri plates / Air sampler method (**2 practical**)
7. Proving of pathogenicity (**1 practical**)
8. Effect of pH and temperature on the growth and development of plant pathogens (fungi) (**2 practical**)
9. Study of symptoms and causal organisms of Stem rust of wheat (**1 practical**)
10. Study of symptoms and causal organisms of Late blight of potato and Downy mildew of grapes (**2 practical**)
11. Study of symptoms and causal organisms of Tikka disease of groundnut and Anthracnose of Mango (**1 practical**)
12. Study of symptoms and causal organisms of Early Blight of tomato and Leaf spot of turmeric (**1 practical**)
13. Study of symptoms and causal organisms of Rust of jowar and Grain smut of jowar (**1 practical**)
14. Study of symptoms and causal organisms of loose smut of wheat and Brown Leaf Spot of Rice (**1 practical**)
15. Study of symptoms and causal organisms of Green ear and ergot of Bajra (**1 practical**)
16. Study of symptoms and causal organisms of Wilt of tur and Whip smut of sugarcane (**1 practical**)



17. Study of symptoms and causal organisms of White rust of mustard and Leaf spot of cabbage (**1 practical**)

18. Study of symptomology of the following diseases-Angular leaf spot of cotton, Papaya mosaic, Leaf Blight and Leaf Rust of soybean, Sigatoka disease of banana, Phanerogamic disease due to Cuscuta (**6 practicals**)

19. Botanical excursions- At least one long and several local excursions are expected.

**Note:**

1. Minimum 16 practicals are expected to be completed during the academic year.
2. The submission of practical record book, excursion report, collected plant material; slides etc. are expected for MSA during the academic year. The MSA carries marks.

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Skeleton Question Paper

End Semester Assessment (ESA)

**DECBP-I**

**Practical Paper-XVII:** Practicals based on theory paper-XIII& XV  
**(Plant Pathology-I&II)**

**Time:** Four hours

**Maximum Marks:** 40

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**Note:**

1. Attempt all questions
  2. All questions carry equal marks
  3. Draw neat and well labeled diagrams wherever necessary
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**Q1.** Calibrate the microscope and measure the size of given spore-**A** (10)

**Q2.** Identify and describe the symptoms and morphology of causal organism from the given specimen-**B** (12)

**Q3.** Identify and describe the symptoms of diseased specimen-**C&D** (10)

**Q4.** Identify and describe the given spots-**E, F, G & H** (04)  
(E-Equipment, F-Diseased plant material, G-Diseased plant material, H-Plant protectant)

**Q5.** Viva-Voce (04)

**OR**



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Annual Pattern

**DECBP-I**

**Practical paper-XVII: Practicals based on theory paper-XIII&XV  
(Systematic Botany-I&II)**

**Learning Objectives:**

1. To study how to describe a flowering plants for their taxonomic details.
2. To study different floras, to prepare plant identification keys and to identify locally available plants.
3. To acquire knowledge of pollen morphology of different plants.

**Learning Outcomes:**

1. The students will be able to describe a flowering plant for its taxonomic details
2. The students will be able to understand in detail the floras, and able to prepare plant identification for the identification of locally available plants.
3. Students will acquire knowledge of pollen grains of different plants.

**Practical Exercises:**

1. Description, identification and classification with sketches, floral formulae and floral diagrams of locally available plants of the families mentioned in the theory syllabus **(24 practical)**
2. Preparation of dichotomous key by studying locally available plants of the same family **(2 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, Ipomoea and Grasses by using acetolysis method **(2 practical)**
5. Botanical excursions- At least one long and several local excursions are expected.

**Note:**

1. Minimum 16 practicals are expected to be completed during the academic year.
  2. The submission of practical record book, excursion report, collected plant material, slides, herbarium etc. are expected for MSA during the academic year. The MSA carries marks.
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Skeleton Question Paper  
End Semester Assessment (ESA)

**DECBP-I**

**Practical Paper-XVII:** Practicals based on theory paper-XIII& XV  
**(Systematic Botany-I&II)**

**Time:** Four hours  
**Maximum Marks:** 40

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**Note:**

1. Attempt all questions
  2. All questions carry equal marks
  3. 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) (04)

**Q5.** Viva-Voce (04)

**OR**



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**DECBP-I**

**Practical paper-XVII: Practicals based on theory paper-XIII&XV  
(Herbal Technology-I&II)**

**Learning Objectives:**

1. To study Ayurvedic medicines, medicinal plants
2. To study different drugs
3. To acquire knowledge of preparation of herbal formulations.

**Learning Outcomes:**

1. The students will be able to know about Ayurvedic medicines, medicinal plants
2. The students will be able to understand in detail the different drugs
3. Students will acquire knowledge of preparation of herbal formulations

**Practical Exercises:**

1. Study of composition, preparation and uses of Ayurvedic medicine (Triphala, Decotion, Syrup) **(4 practicals)**
2. Macroscopic and microscopic evaluation of medicinal plants as mentioned in the theory courses used as-Root drug, Stem drug, Leaf drug **(6 practicals)**
3. Study of leaf constant (stomatal number, stomatal index and palisade ratio) **(3 practicals)**
4. Preliminary phytochemical screening of alkaloids, flavonoids, steroids, glycosides, Carotenoids as mentioned in courses **(4 practicals)**
5. Isolation and extraction of crude drug by using soxhlet/reflex assembly **(3 practicals)**
6. Separation of alkaloids, flavonoids, steroid, carotenoids, glycosids drug using paper chromatography/ TLC /HPTLC **(4 practicals)**
7. Quantitative estimation of secondary metabolites as mentioned in theory courses **(4 practicals)**
8. Preparation of herbal formulation (antiseptic creams/hair oils / skin moisturizer / facial creams /shampoo) **(4 practicals)**
9. Excursions- At least one long and several local excursions are expected.

**Note:**

1. Minimum 16 practicals are expected to be completed during the academic year.
2. The submission of practical record book, excursion report, collected plant material, slides etc. are expected for MSA during the academic year. The MSA carries marks.



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Skeleton Question Paper  
End Semester Assessment (ESA)

**DECBP-I**

**Practical paper-XVII:** Practicals based on theory paper-XIII&XV  
**(Herbal Technology-I&II)**

**Time:** Four hours

**Maximum Marks:** 40

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**Note:**

1. Attempt all questions
  2. All questions carry equal marks
  3. Draw neat and well labeled diagrams wherever necessary
- 

**Q1.** Macroscopic and microscopic evaluation of the given material-**A** (10)  
(root/stem/leaf drug)

**OR**

Preparation and study of the herbal formulation-**B** (Hair oil/Skin moisturizer/Antiseptic cream/Triphalachurna/Decoction/Syrups)

**Q2.** Study of leaf constant (stomatal number, index, palisade ratio) (10)

**OR**

Isolation and extraction of crude drug by suitable methods

**Q3.** Preliminary phytochemical test or screening of drugs-**C&D** (10)

**OR**

Separation of alkaloids/flavonoids/steroids/carotenoids/glycosides using paper/TLC/HPTLC methods

**Q4.** Identify and describe the spot-**E,F,G,H,I&J** (06)

(E-Root drug, F-Stem drug, G-Leaf drug, H&I-Herbal formulations, J-Instrument)

**Q5.** Viva-Voce (04)



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**SKILL ENHANCEMENT COURSES (SEC)**

**SEC-III:** Trichoderma cultivation Technique

OR

**SEC-III:** Medicinal Plant Product Preparation Skill

**SEC-IV:** Mushroom Cultivation

OR

**SEC-IV:** Herbal Drug Technology

Periods (Theory& Practicals): 45

Credits: 02 (Maximum Marks: 50)

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**SEC-III: TRICHODERMA CULTIVATION TECHNIQUE**

**UNIT-I: CONCEPT OF BIOCONTROL** (6 periods)

Introduction, Definition, Biocontrol agents, Need of biocontrol, Concept of biocontrol (ways, limitations and factors affecting success of biocontrol, Environmental health hazards due to pesticides and fungicides), Plant based products (Azadirachtin, Neem cake, Indiar, Pyrethrines, Phermones, Trichoderma etc.)

**UNIT-II: TRICHODERMA CULTIVATION** (15 periods)

Introduction, Systematic position, thallus structure, Trichoderma as biocontrol agent, Mode of action, Uses, Trichoderma as a commercial biocontrol agent, Cultivation details of Trichoderma

**UNIT-III: PRACTICALS ON TRICHODERMA CULTIVATION** (8 practicals)

Principle, Requirement, procedure, observations, Harvesting, results and records precautions, Visit to a Trichoderma cultivation laboratory in nearby area (Students are expected to prepare a model of Trichoderma cultivation laboratory, a visit report and to submit the same at the time of practical examination.

OR

**SEC-III: MEDICINAL PLANT PRODUCT PREPARATION SKILL**

**UNIT-I: MEDICINAL PLANTS** (6 periods)

Introduction, Definitions, Scope and Importance, Concept of active principles

**UNIT-II: STUDY OF MEDICINAL PLANTS** (15 periods)

Description, Identification and Classification, medicinal uses of locally available medicinal plants (Awla, Adulsa, Ginger)

**UNIT-III: PRACTICALS ON MEDICINAL PLANT PRODUCT PREPARATION** (8 practicals)

Preparation of Awla candy, Awla masticator (Awla supari), Adulsa syrup, Ginger syrup and cake, Visit to a production industry in nearby area (Students are expected to prepare a model of production industry, a visit report and to submit the same at the time of practical examination.



#### **SEC-IV: MUSHROOM CULTIVATION**

##### **UNIT-I: FUNGAL BIOMASS AS NON CONVENTIONAL FOOD** (6 periods)

Introduction, Concept and need, Advantages, disadvantages and Sources of non-conventional food

##### **UNIT-II: MUSHROOM (*PLEUROTUS*) CULTIVATION** (15 periods)

Introduction, Systematic position, thallus structure and fruit body of *Pleurotus*, Merits of *Pleurotus* cultivation, Commercial cultivation of *Pleurotus*, Cultivation details of *Pleurotus* (Substrate, Soaking, Pasteurization, Spawning, Cropping, Picking and Packing, Flow chart), *Pleurotus* products fresh and processed

##### **UNIT-III: PRACTICALS ON MUSHROOM (*PLEUROTUS* CULTIVATION)**

(8 practicals)

Principle, Requirement, procedure, observations, Harvesting, results and records, Visit to a Mushroom cultivation laboratory in nearby area (Students are expected to prepare a model of Mushroom cultivation laboratory, a visit report and to submit the same at the time of practical examination.

**OR**

#### **SEC-IV: HERBAL DRUG PROCESSING**

##### **UNIT-I: INTRODUCTION** (11 periods)

Role of natural products in herbal medicine, General status and importance of herbal medicine, Safety of herbals / herbal pharmacovigilance, WHO policy on herbal medicine, Herbs as raw materials: Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation, Source of Herbs, Selection, identification and authentication of herbal materials drying and processing of herbal raw material, Extraction of Herbal Materials, Choice of solvent for extraction, Methods used for extraction and principles involved in extraction

##### **UNIT-II: STANDARDIZATION OF HERBAL DRUGS** 10 periods)

Standardization of herbal formulations and herbal extracts, Standardization of herbal extracts as per WHO and cGMP guidelines, Physical, chemical, spectral and toxicological standardization, qualitative and quantitative estimations exemplified by the method of preparation of at least two standardized extracts, Stability studies for extract, Predictable chemical and galenical changes

##### **UNIT-III: PRACTICALS ON HERBAL DRUG PROCESSING** (8 practicals)

Qualitative and Quantitative Microscopic Examination: Microscopic evaluation of powder drugs and their mixtures with adulterants, Exercises based on standardization and quality control of plant drugs, Qualitative and Quantitative Estimation of Phytoconstituents, Determination of phytoconstituents in crude drugs and commercial herbal formulations, Pharmacopoeial evaluation of natural products, Determination of ash values, extractive values, Swelling index and foaming index of crude drugs as per WHO Guidelines, Preparation of detailed monograph of at least one plant drug covering Pharmacognosy and Phytochemical investigation with its use in traditional system of medicine, Experiment on raw material standardization, purification of extracts with chromatographic techniques, Isolation of piperine from pepper, Isolation of Hesperidine from orange peel, Isolation & TLC of Reserpine from Rauwolfia root, Isolation & TLC of Menthol from Mentha oil, Preparation and Evaluation of Herbal formulations



**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
Semester Pattern Curriculum Under CBCS For  
Faculty of Science & Technology, Under Graduate (UG) Programme  
**CLASS: B. Sc. THIRD YEAR, SUBJECT: BOTANY**

**Selected Readings for SEC:**

1. Fruit and Vegetable Preservation Principles and Practices-Srivastava R.P. and Sanjeev Kumar International Book Distributing Company, New Delhi-2005
2. Post Harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management vol. I & II Varma L. R. and Joshi V.K. Indus Publishing, 2000
3. Preservation of Fruits and Vegetables Khader ICAR, New Delhi-2010
4. Skills in plant science-Bodke S.S. & N.M.Dhekle
5. Fruit and Vegetable Processing M.G. Danthy FAO, Rome
6. Post harvest Handling and Processing of Fruit and Vegetable-I.S. Singh Text book
7. Fruit Processing- David Arthey, Reference book
8. Handbook of Fruit- Sinha and Hui John Wiley and
9. Preservation -Principles and Practices-Srivastava RP & Kumar S International Book, Distributors, 2003
10. Handbook of Fruit Science &Technology: Production, Composition and Processing- Salunkhe DK

Mark Sheet  
End of Semester Assessment (ESA)  
**SKILL ENHANCEMENT COURSE (SEC)-III&IV**

**Maximum Marks: 25**

**Candidate's Seat No:**

<b>Sr. No.</b>	<b>Assessment Criteria</b>	<b>Maximum Marks</b>	<b>Obtained Marks</b>
1.	Skill work report submission	10	
2.	Over all skill judgment	10	
3.	Skill work presentation	05	
4.	Total	25	

**Name & Signature of :**

Examiner- 1:

Examiner- 2:

\*\*\*\*\*11102021\*\*\*\*\*