।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्याशाखेने **दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व दिनांक १२ जून २०२१ रोजी संपन्न झालेल्या ५१ व्या मा. विद्या परिषद बैठकीतील विषय क्र. २६/५१–२०२१**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

1. B.Sc.-III Year-Biophysics
2. B.Sc.-III Year-Bioinformatics
3. B.Sc.-III Year-Biotechnology
4. B.Sc.-III Year-Biotechnology (Vocational)
5. B.Sc.-III Year-Botany
6. B.Sc.-III Year-Horticulture
7. B.Sc.-III Year-Agro Chemical Fertilizers
8. B.Sc.-III Year-Analytical Chemistry
9. B.Sc.-III Year-Biochemistry
10. B.Sc.-III Year-Chemistry
11. B.Sc.-III Year-Dyes & Drugs Chemistry
12. B.Sc.-III Year-Industrial Chemistry
13. B.C.A. (Bachelor of Computer Application)-III Year
14. B.I.T. (Bachelor of Information Technology)-III Year
15. B.Sc.-III Year-Computer Science
16. B.Sc.-III Year-Network Technology
17. B.Sc.-III Year-Computer Application (Optional)
18. B.Sc.-III Year-Computer Science (Optional)
19. B.Sc.-III Year-Information Technology (Optional)
20. B.Sc.-III Year-Software Engineering
21. B.Sc.-III Year-Dairy Science
22. B.Sc.-III Year-Electronics
23. B.Sc.-III Year-Environmental Science
24. B.Sc.-III Year-Fishery Science
25. B.Sc.-III Year-Geology
26. B.Sc.-III Year-Mathematics
27. B.Sc.-III Year-Microbiology
28. B.Sc.-III year Agricultural Microbiology
29. B.Sc.-III Year-Physics
30. B.Sc.-III Year Statistics
31. B.Sc.-III Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **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–सीबीसीएस अभ्यासक्रम/२०२१–२२/७५

दिनांक : १२.०७.२०२१.

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
७) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

B.Sc. THIRD YEAR
BOTANY-CURRICULUM
(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 is 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):

PEO-1: To provide an updated education to the students at large in order to know the importance and scope of the discipline and to provide mobility to students from one university or state to other.

PEO-2: To update curriculum by introducing recent advances in the subject and enable the students to face the competitive examinations successfully.
PEO-3: To impart knowledge of plant science as the applied objective of education.
PEO-4: To develop a scientific attitude to make students open minded, critical and curious.
PEO-5: To develop an ability to work on their own and to make them fit for the society.
PEO-6: To develop skill in practical work, experiments, equipments and laboratory use.
PEO-7: To develop ability for the application of the acquired knowledge in the fields of Botany so as to make our country self reliant and self sufficient.
PEO-8: To appreciate and apply ethical principles of plant science.

PROGRAM OUTCOMES (POs):
PO-1: This program will train and orient the students in the field of cell biology, molecular biology, genetics, plant breeding, plant pathology, systematic botany and herbal technology.
PO-2: This program will help the students for their career development.
PO-3: This program will provide updated curriculum with recent advances in the subject and enable the students to face the competitive examinations successfully.
PO-4: This program shall train and orient the students for laboratory skills and serve as human resource for the educational institutes, industries and other organizations.
PO-5: The programme also has a strong interdisciplinary component. Emphasis is given on the experimental learning through hands-on laboratory exercises, field trips and assignments.
PO-6: Students will be able to understand and explain different specializations in Botany such as cell biology, molecular biology, genetics, plant breeding, plant pathology, systematic botany and herbal technology etc. Students will be able to demonstrate the experimental techniques and methods in plant sciences and have innovative research ideas.
PO-7: The programme will enlighten the current thrust areas of the subject and provide substantial exposure and skills in Botany.
PO-8: Skill Enhancement Courses being offered during this program will provide job opportunities and additional specific skills to the students for self employability through the development of their own enterprises.

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.

UTILITY OF COURSE:
This program will train and orient the students in the field of Botany and Agriculture. This will help the students for their career development. Practical Courses offered during this program will provide additional specific knowledge to the students for self employability through the development of their own enterprises.

An outline:

Semester/ Annual	Course No.	Course Name	Instruction Hrs/week	Total Periods	Marks for		Credits (Marks)
					Internal (CA)	External (ESE)	
Semester-V	**DSCB-I**	**DSCB-I:** Cell and Molecular biology **(Theory Paper-XII)**	03	45	10	40	Credits: 02 (Marks:50)
	DECB-I	**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)**	03	45	10	40	Credits: 02 (Marks:50)
Semester-VI	**DSCB-II**	**DSCB-II:** Genetics and Plant breeding **(Theory Paper-XIV)**	03	45	10	40	Credits: 02 (Marks:50)
	DECB-II	**DECB-II:** Plant Pathology-II **(Theory Paper-XV)** **OR** **DECB-II:** Systematic Botany-II **(Theory Paper-XV)** **OR** **DECB-II:** Herbal Technology-II **(Theory Paper-XV)**	03	45	10	40	Credits: 02 (Marks:50)
Annual Pattern	**DSCBP-I**	**DSCBP-I:** Practicals based on DSCB-I & II **(Practical Paper-XVI)**	03	16 Practicals/Batch/ Year	10	40	Credits: 02 (Marks:50)
	SECB-III	**SECB-III:** Trichoderma Cultivation Technology **OR** **SEC-III:** Medicinal plant product preparation skill	03	45 (Theory periods-21/Year, Practicals-08/year)	25	25	Credits: 02 (Marks:50)
Annual Pattern	**DECBP-I**	**DECBP-I:** Practicals based on DECB-I & II **(Practical Paper-XVII)**	03	16 Practicals/Batch/ Year	10	40	Credits: 02 (Marks:50)
	SECB-IV	**SECB-IV**: Mushroom Cultivation **OR** **SECB-IV:** 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, **ESE:** End of semester examination, **CA:** Continuous Assessment,
SECB: Skill Enhancement Course in Botany,
Distribution of credits (80% of the total credits for ESE and 20% for CA):
CA of 10 Marks (Theory): 05 marks for Test and 05 marks for home assignment
CA of 10 Marks (Practical): 05 marks for Test and 05 marks for Record book & submissions (Excursion report, collected plant material, keys, models etc.)
CA of Marks 25: 15 for marks Seminar & 10 marks for Test)

SEMESTER–V

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

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

DESCIPLINE 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)

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 organells 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 organells 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: G0 - G1 - S - G2 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. Molecular Basis of Gene Mutation and related diseases: Phenylketonuria (PKU), Alkaptonuria (AKU), Albinism 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
Total		**45**	**80**

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: enzymes, toxins and growth regulators.

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 capsci*), Citrus canker, Sigatoka disease of Banana, leaf blight 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
Total		**45**	**80**

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
Total		**45**	**80**

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 pharmacognocy.
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 pharmacognocy.
3. Students will acquire knowledge of standardization of drugs.

UNIT-I: MEDICINAL AND AROMATIC PLANTS (MAP) (11periods) 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	Pharmacognocy	11	20
Unit-IV	Drug standardization	12	20
Total		**45**	**80**

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:
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 *Asparasgus*).

UNIT –II: GENETICS-II (12 Periods)
1. Linkage: (Definitions and significance) Coupling and repulsion hypothesis. Type of linkage (maize and drosophila), Sex linked inheritance: Definition classification (x-linked, y-linked and xy-linked) 2. 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-Autoployploidy 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), Role of Biotechnology in crop improvement (brief account)

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
Total		**45**	**80**

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 Defence 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 Defence mechanism and management.
3. Students will acquire knowledge of different plant diseases in different plants.

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

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, Rust of Soybean, 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 Defence mechanism and disease management	11	20
Unit-III	Plant Diseases-I	11	20
Unit-IV	Plant Diseases-II	12	20
Total		**45**	**80**

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)
Place and Time of origin of angiosperms, 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 mocot families-I	12	20
Unit-II	Study of mocot families-II	12	20
Unit-III	Principles of taxonomy	11	20
Unit-IV	Origin of angiosperms	10	20
Total		**45**	**80**

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 (11periods)
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. (11periods)
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)

Unit	Title	Period Allotted	Maximum Marks
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
Total		**45**	**80**

Skeleton Question Paper
End Semester Examination (ESE)
SEMESTER–V&VI
Theory Paper-XII, XIII & XIV, XV

Time: 1Hour 30 Min
Maximum Marks: 40

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

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.

Annual Pattern

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)

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:
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. Demonstration of hybridization techniques-Emasculation, Bagging (**1Practical**)
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 CA during the academic year. The CA carries marks.

Skeleton Question Paper
End Semester Examination (ESE)
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

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

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-**D,E,F&G** (16)
(Problem-D based on Dihybrid ratio, Problem-E based on Gene interactions, Problem-F based on Collaborator Gene and Problem-G based on Sex linked inheritance respectively)

Q4. Identify and describe in brief the given spot-**H,I,J&K** (04)
(Spot-H based on Cell organells, spot-I based on Giant chromosome/Chromosome-SAT/Centromere, spot-J based on Syndromes, spot-K based on Tools in Hybridization)

Q5. 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 (**1practical**)
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 guava (**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 Leaf blight 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-Citrus canker, Root knot of tomato, Angular leaf spot of cotton, Papaya mosaic, Rust of soybean, Sigatoka disease of banana, Anthracnose of mango , 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 CA during the academic year. The CA carries marks.

Skeleton Question Paper
End Semester Examination (ESE)
DECBP-I
Practical Paper-XVII: Practicals based on theory paper-XIII& XV
(Plant Pathology-I&II)

Time: Four hours
Maximum Marks: 40

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

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

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 CA during the academic year. The CA carries marks.

Skeleton Question Paper
End Semester Examination (ESE)
DECBP-I
Practical Paper-XVII: Practicals based on theory paper-XIII& XV
(Systematic Botany-I&II)

Time: Four hours
Maximum Marks: 40

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

Annual Pattern
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 CA during the academic year. The CA carries marks.

Skeleton Question Paper
End Semester Examination (ESE)
DECBP-I
Practical paper-XVII: Practicals based on theory paper-XIII&XV
(Herbal Technology-I&II)

Time: Four hours
Maximum Marks: 40

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)

Annual Pattern

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)

SEC-III: TRICHODERMA CULTIVATION TECHNIQUE

UNIT-I: 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, Indiara, 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 Pharmacognocy 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 Hespiridine from orange peel, Isolation & TLC of Reserpine from Rauwolfia root, Isolation & TLC of Menthol from Mentha oil, Preparation and Evaluation of Herbal formulations

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 Examination (ESE)
SKILL ENHANCEMENT COURSE (SEC)-III&IV

Maximum Marks: 25

Candidate's Seat No.:

Sr. No.	**Assessment Criteria**	**Maximum Marks**	**Obtained Marks**
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: