।। 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
25 1994 - 2019 SILVER JUBILEE YEAR
ACADEMIC (1-BOARD OF STUDIES) SECTION
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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील प्रथम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक ०८ जून २०१९ रोजी संपन्न झालेल्या ४४व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/४४–२०१९** च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील प्रथम वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्यात येत आहेत.

1. Bioinformatics
2. Biotechnology
3. Boichemistry
4. Botany
5. Chemistry
6. Computer Management
7. Computer Science
8. Dairy Science
9. Environmental Science
10. Herbal Medicine
11. Information Technology
12. M.C.A.
13. Microbiology
14. Physics
15. Software Engineering
16. System Administration & Networking
17. Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदव्युत्तर–सीबीसीएस अभ्यासक्रम/२०१९–२०/**४६४**
दिनांक : ११.०७.२०१९.

स्वाक्षरित/–
उपकुलसचिव
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.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR

SEMESTER I & II

BOTANY– CURRICULUM

JUNE, 2019..

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

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 Choice Based Credit System (CBCS) 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. Revision and updating of the curriculum is the continuous process to provide an updated education to the students at large. 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 M.Sc. Botany (General) semester pattern course is running in different affiliated colleges of the SRTMUN. The course content has been designed on 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, weightage of maximum marks and credits are mentioned. A list of practical exercises for laboratory course work based on theory papers to be completed in the academic year is also given. A list of selected reading material and a common skeleton question paper for all the theory papers of semester-I&II are also provided at the end of the syllabus.

Salient Features:

The syllabus of M. Sc. Botany has been framed to meet the requirement of Choice based Credit System. The syllabus is framed as per the guidelines of UGC, New Delhi. The papers offered here in this syllabus will train and orient the students in the field of Botany. In the First semester papers are introduced to enhanced preliminary knowledge of Botany. In the second semester papers are based on Bioinstrumentation, Cell biology, Genetics, Plant

breeding, Ecology, Environmental biology and Biodiversity conservation. In semester third and fourth papers are based on applied aspects of Botany in which the papers like Plant physiology, Molecular biology, Biotechnology are kept as compulsory papers. Elective papers with specialization Plant Pathology, Angiosperm Taxonomy and Seed technology are introduced in third and fourth semester. Laboratory course works are based on respective theory papers.

Learning Objectives:

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.
2. To update curriculum by introducing recent advances in the subject and enable the students to face NET, SET, MPSC, UPSC and other competitive examinations successfully.
3. To impart knowledge of plant science as the basic objective of Education
4. To develop a scientific attitude to make students open minded, critical and curious
5. To develop an ability to work on their own and to make them fit for the society
6. To expose themselves to the diversity amongst life forms
7. To develop skill in practical work, experiments, equipments and laboratory use along with collection and interpretation of plant materials and data
8. To make aware of natural resources and environment and the importance of conserving the same
9. 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
10. To appreciate and apply ethical principles to plant science research and studies

Learning Outcomes:

This program will train and orient the students in the field of Botany. The students will be placed in plant based industries, research and educational institutes. They can

establish their own tissue culture labs. They can provide consultancy services for cultivation of medicinal plants and Identification of plants.

Prerequisite:

The students who passed B. Sc. with Botany as one of the optional subjects with 24 credits are eligible to take admission for PG course in Botany.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR BOTANY CURRICULUM

Semester-I

An Outline:

Paper number & Title	Credits (Marks)			Periods
	External: ESE	Internal: CA	Total Credits (Marks)	
Theory Paper-I: Biology and Diversity of Microbes	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-II: Biology and Diversity of Cryptogams	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-III: Taxonomy of Angiosperms and Gymnosperms	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Theory Paper-IV:** Plant Anatomy and Embryology of Angiosperms **(Elective)**	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-V: Seminar/ MOOCs (SWAYAM/NPTEL)	-	Credit: 01 (Marks:25)	Credits: 01 (Marks:25)	-
Total	Credit: 12 (Marks: 300)	Credit: 05 (Marks:125)	Credits: 17 (Marks:425)	240

(**ESE:** End of Semester Examination, **CA:** Continuous Assessment, ***:** Elective paper)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR BOTANY CURRICULUM

Semester-II

An Outline:

Paper number & Title	Credits (Marks)			Periods
	External: ESE	Internal: CA	Total Credits (Marks)	
Theory Paper-VI Bioinstrumentation and Methods in Biology	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-VII: Cell Biology, Genetics and Plant Breeding	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-VIII: Plant Resource Utilization and Biodiversity Conservation	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Theory Paper-IX:** Plant Ecology , Environmental Biology and Phytogeography **(Elective)**	Credit: 03 (Marks:75)	Credit: 01 (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-X: Seminar/ MOOCs (SWAYAM/NPTEL)	-	Credit: 01 (Marks:25)	Credits: 01 (Marks:25)	-
Total	Credit: 12 (Marks: 300)	Credit: 05 (Marks:125)	Credits: 17 (Marks:425)	240

(**ESE:** End of semester examination, **CA:** Continuous assessment, ***:** Elective paper)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR BOTANY
LABORATORY COURSE WORK
Annual Pattern

An Outline:

Paper number & Title	Credits (Marks)			Practicals
	External: ESE	Internal: CA	Total Credits (Marks)	
Laboratory Course Work-I: Based on theory paper-I&II	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
Laboratory Course Work-II: Based on theory paper-III&IV	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
Laboratory Course Work-III: Based on theory paper-VI&VII	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
Laboratory Course Work-IV: Based on theory paper-VIII&IX	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
Total	Credit: 12 (Marks: 300)	Credit: 05 (Marks:125)	Credits: 16 (Marks:425)	60

(**ESE:** End of semester examination, **CA:** Continuous assessment, ***:** Elective paper)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

M. Sc. SECOND YEAR BOTANY CURRICULUM

Semester-III

An Outline:

Paper number & Title	Credits (Marks)			Periods
	External: ESE	Internal: CA	Total Credits (Marks)	
Theory Paper-XI: Plant physiology	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-XII: Molecular Biology and Biostatistics	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Elective-A (For Specialization In Plant Pathology)**				
***Theory Paper-XIII:** Plant pathology-I (Principles of Plant Pathology)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Theory Paper-XIV:** Plant pathology-II (Diseases of crop plants and their management)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
OR *Elective-B (For Specialization In Angiosperms)				
***Theory Paper-XIII:** Angiosperms-I (Systematics of Angiosperm-I)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Theory Paper-XIV:** Angiosperms-II (Plant Structure and Reproductive Biology)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

Paper number & Title	**Credits (Marks)**			**Periods**
	External: ESE	**Internal: CA**	**Total Credits (Marks)**	
OR ***Elective-C** **(For Specialization In Seed Technology)**				
***Theory Paper-XIII:** Seed Technology-I (Principles of Seed technology)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Theory Paper-XIV:** Seed Technology-II (Seed pathology)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-XV: Seminar/ MOOCs (SWAYAM/NPTEL)	-	Credit: 01 (Marks:25)	Credits: 01 (Marks:25)	-
Total	Credit: 12 (Marks: 300)	Credit: 05 (Marks:125)	Credits: 17 (Marks:425)	240

(**ESE:** End of semester examination, **CA:** Continuous assessment, ***:** Elective paper)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

M. Sc. SECOND YEAR BOTANY CURRICULUM

Semester-IV

An Outline:

Paper number & Title	Credits (Marks)			Periods
	External: ESE	Internal: CA	Total Credits (Marks)	
Theory Paper-XVI: Biochemistry and Plant Metabolism	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-XVII: Biotechnology and Genetic Engineering	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Elective-A (For Specialization In Plant Pathology)**				
***Theory Paper-XVIII:** Plant pathology-III (Physiological and Molecular Plant pathology)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Test: 15 marks, Assignment: 10marks)	Credits: 04 (Marks:100)	60
***Theory Paper-XIX:** Plant pathology-IV (Diseases of Fruit plants and their management)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
OR *Elective-B (For Specialization In Angiosperms)				
***Theory Paper-XVIII:** Angiosperms-III (Systematics of Angiosperms-II)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Theory Paper-XIX:** Angiosperms-IV (Phytochemistry and Pharmacognosy)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
OR *Elective-C				

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

Paper number & Title	**Credits (Marks)**			**Periods**
	External: ESE	**Internal: CA**	**Total Credits (Marks)**	
(For Specialization In Seed Technology)				
***Theory Paper-XVIII:** Seed Technology-III (Seed Production and Processing)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
***Theory Paper-XIX:** Seed Technology-IV (Seed Health testing and Management)	Credit: 03 (Marks:75)	Credit: 01 (Marks:25) (2 Tests: 20 marks , Assignment: 05 marks)	Credits: 04 (Marks:100)	60
Theory Paper-XX: Seminar/ MOOCs (SWAYAM/NPTEL)	-	Credit: 01 (Marks:25)	Credits: 01 (Marks:25)	-
Total	Credit: 12 (Marks: 300)	Credit: 05 (Marks:125)	Credits: 17 (Marks:425)	240

(**ESE:** End of semester examination, **CA:** Continuous assessment, ***:** Elective papers)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

M. Sc. SECOND YEAR BOTANY LABORATORY COURSE WORK

Annual Pattern

An Outline:

Paper number & Title	Credits (Marks)			Practicals
	External: ESE	Internal: CA	Total Credits (Marks)	
Laboratory Course Work-V: Based on theory paper-XI&XII	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
***Laboratory Course Work-VI:** Based on theory paper-XIII & XIV	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
Laboratory Course Work-VII: Based on theory paper-XVI, XVII, XVIII & XIX	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
***Laboratory Course Work-VIII:** Project Work	Credit: 03 (Marks:75)	Credit: 01 (Marks:25)	Credits: 04 (Marks:100)	15
Total	Credit: 12 (Marks: 300)	Credit: 05 (Marks:125)	Credits: 16 (Marks:425)	60

(**ESE:** End of semester examination, **CA:** Continuous assessment, ***:** Elective paper)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology
Post Graduate (PG) Program
BOTANY- CURRICULUM
w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR
SEMESTER – I
BOTANY

JUNE, 2019

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science and Technology

Post Graduate (PG) Program

BOTANY- CURRICULUM

w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR

SEMESTER – I

BOTANY

THEORY PAPER-I: BIOLOGY AND DIVERSITY OF MICROBES

Periods: 60 Credits: 04

Learning Objectives

1. To study and impart knowledge about the occurrence, distribution, structure and life history of Bacteria, Viruses and lower plants such as fungi, lichens
2. To inspire students to study diversity of plant forms

Learning outcomes:

1. Understand the morphology, structure and importance of the various organisms
2. Differentiate between various groups of Fungi, Bacteria, Viruses, and Lichens & Mycorrhiza.
3. Learn the life cycles of individuals belonging to Fungi, Bacteria, Viruses, Lichens & Mycorrhiza.

UNIT –I: BACTERIA (15 Periods)

Bacteria: General characters, Classification based on Bergey's manual, Ultra Structure, Structure of Endospore, Nutrition (Autotrophic, Heterotrophic and Symbiotic), Reproduction (Binary fission, Transformation, Transduction and Conjugation), Differential staining of bacteria- Gram Staining. Symptoms of Bacterial diseases of plants, Bacterial Diseases: Citrus canker, Black arm of cotton and Soft rot of Potato. Economic importance of bacteria.

UNIT – II: VIRUSES AND MYCOPLASMA (15 Periods)

Viruses: General characters, classification, chemical composition, Ultra structure of plant viruses (TMV), Virus multiplication, transmission of plant viruses, Symptoms of viral diseases of plants. Viral Disease: Bean Mosaic Virus, Leaf curl of Papaya and Yellow Vein Mosaic of Bhendi. Economic importance of viruses.

Mycoplasma: General characters, Ultra structure, Symptoms of Mycoplasma diseases of plants, Mycoplasmal Diseases: Grassy shoot disease, Sessamum phyllody and Little leaf of brinjal. Economic importance of Mycoplasma.

UNIT – III: INTRODUCTORY MYCOLOGY (15 Periods)

Fungi: General characters, Classification (As per Ainsworth, 1973; Alexopoulos and Mims, 1979), Ultra structure of fungal cell, Thallus organization, Nutrition (Saprotrophs, Biotrophs, Necrotrophs, Symbiotrophs) and reproduction (Asexual and Sexual). A comparative account of vegetative and reproductive structures, Life cycle patterns and Phylogeny of different fungal groups- Gymnomycota, Mastigomycota and Amastigomycota: Zygomycotina, Ascomycotina, Basidiomycotina and Deteuromycotina. Fungal Diseases: Early Blight of tomato, Downy mildew of grape and yellow rust of wheat.

Lichens: General characters, types and economic importance.

UNIT – IV: APPLIED MYCOLOGY (15 Periods)

Fungi as food and feeds: Mushrooms – Types, cultivation, nutritional and medicinal value. Role of fungi in food processing. **Fungi in industry**: Production of alcohol, medicine, organic acids and enzymes. **Fungi in agriculture and forestry**: Role of fungi in humus formation, formation of mycorrhizal association with plants; Role of fungi in biological control of pests, Fungi as bio fertilizers: Mycorrhizae Types (Ecto and endo). Fungi in destruction of articles in daily use: Wood destruction, spoilage of house hold articles

M. Sc. FIRST YEAR
BOTANY

LABORATORY COURSE WORK: BASED ON THEORY PAPER – I
(Annual Pattern)

Practical Exercises:

1. Preparation of Stains (Cotton blue, Lactophenol, Gram's iodine, Crystal violet, Safranine, light green).
2. Preparation of Culture media (PDA /Czapek Dox Agar/ Nutrient Agar.)
3. Staining of bacteria by Gram's staining method.
4. Isolation and identification of fungi from Air.
5. Isolation and identification of fungi from Soil by dilution plate technique.
6. Study of fungi: *Stemonitis, Agaricus, Polyporus, Ganoderma.*
7. Determination of alcohol produced by Yeast (*Saccharomyces cerevisiae*)
8. Estimation of Citric acid produced by *Aspergillus niger.*
9. Antibiotics assay by *Penicillium* sp.
10. Study of symptoms and causal organism of bacterial plant diseases: Citrus canker, Black arm of cotton and Soft rot of Potato
11. Study of symptoms and causal organism of plant diseases caused by Viruses: Bean Mosaic Virus, Leaf curl of Papaya and Yellow Vein Mosaic of Bhendi
12. Study of symptoms and causal organism of plant diseases caused by Mycoplasma: Grassy shoot disease, Sessamum phyllody and Little leaf of brinjal
13. Study of symptoms and causal organism of plant diseases caused by Fungi: Early Blight of tomato, Downy mildew of grape and Yellow rust of wheat.
14. Study of crustose, foliose and fruticose lichens.
15. At least one long botanical excursion, two local study tours and visits to Industries, Research institutes, Agriculture universities etc.

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w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR

SEMESTER – I

BOTANY

THEORY PAPER-II: BIOLOGY AND DIVERSITY OF CRYPTOGAMS

Periods: 60 Credits: 04

Learning Objectives

1. To study and impart knowledge about the occurrence, distribution, structure and life history of Algae, Byrophyta and Pterdophyta.
2. To inspire students to study diversity of plant forms

Learning outcomes:

1. Understand the morphology, structure and importance of the various organisms
2. Differentiate between various groups of Algae, Byrophyta and Pterdophyta.
3. Learn the life cycles of individuals belonging to Algae, Byrophyta and Pterdophyta.

UNIT-I: ALGAE-I (15 Periods)

Introduction: General characters, Criteria for classification of algae and classification of algae as per F.E. Fritsch (1944) and G.M. Smith (1955), Ultra structure of algal cell, Algae in diversified habitats (terrestrial, fresh water, marine) thallus organization, Reproduction (vegetative, asexual and sexual), pigments in algae, reserve food, Types of flagella, algal blooms, and Algal Culture: Cultivation of Spirulina, SCP.

UNIT-II: ALGAE-II (15 Periods)

General Morphology, reproduction and Phylogenenetic considerations of Chlorophyta, Charophyta, Xanthophyta, Chrysophyta, Phaeophyta, Cyanophyta and Rhodophyta. Economic importance of Algae as biofertilizer; food; feed; and use in industry, Algae in Symbiotic association, as pollution indicator; phytoplanktons and water blooms. Fossil Algae.

UNIT-III: BRYOPHYTA (15 Periods)

Introduction: Habitat, Habit, distribution and outline of classification of Bryophytes as per Smith (1955) and Proskauer (1957). Thallus Organization; internal structure and reproduction in Marchantiales, Jungermanniales, Anthocerotales, Sphagnales, Funariales and Polytrichales. Structure and evolution of gametophytes and sporophytes in Bryophytes, Fossil Bryophytes, Economic and ecological importance of Bryophytes.

UNIT-IV: PTERIDOPHYTA (15 Periods)

Pteridophyta: General characters and classification (based on the classification proposed by Smith, 1955; Bold, 1957 and Zimmermann, 1959). Morphology, anatomy and reproduction in Psilotales, Lycopodiales, Equisetales, Filicales and Marsileales. Steler organization and evolution in Pteridophytes; Heterospory and seed habit; Geological Time Scale & Fossilization process. Economic importance of Pteridophytes.

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LABORATORY COURSE WORK: BASED ON THEORY PAPER – II
(Annual Pattern)

Practical Exercises:

1. Identification, classification and description, of the algae *Volvox, Hydrodictyon, Pithophora.*
2. Identification, classification and description, of the algae *Nostoc, Oscillatoria.*
3. Identification, classification and description, of the algae *Chara, Nitella, Xanthophyta-Botrydium, Vaucheria.*
4. Identification, classification and description, of the algae *Laminaria, Sargassum, Ectocarpus, Diatoms*
5. Identification, classification and description, of the algae *Fucus, Batrachospermum, Polysiphonia.*
6. Study of External and Internal Structure of *Marchantia, Pellia*.
7. Study of External and Internal Structure of *Anthoceros, Notothallus*.
8. Study of External and Internal Structure of *Sphagnum, Funaria, Polytrichum*.
9. Study of Morphology, Internal Structure (Double stained slide preparation) and reproductive Structures of *Psilotum, Lycopodium*
10. Study of Morphology, Internal Structure (Double stained slide preparation) and reproductive Structures of *Selaginella, Equisetum, Marsilea*
11. Study of Morphology, Internal Structure (Double stained slide preparation) and reproductive Structures of *Ophioglossum* and *Pteris*
12. At least one long Botanical excursion and two local study tours.

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SEMESTER – I

BOTANY

THEORY PAPER-III: TAXONOMY OF ANGIOSPERMS AND GYMNOSPERMS

Periods: 60 Credits: 04

Learning Objectives

1. To study and impart knowledge about the occurrence, distribution, structure and life history of Gymnosperms, Angiosperms and fossil plants.
2. To inspire students to study diversity of plant forms

Learning outcomes:

1. Understand the morphology, structure and importance of the various organisms.
2. Differentiate between various groups of Gymnosperms, Angiosperms and fossil plants.
3. Learn the characters of taxa belonging to Gymnosperms, Angiosperms and fossil plants.

UNIT-I: GYMNOSPERMS & PALAEOBOTANY (15 Periods)

General characters and classification Gymnosperms as proposed by Professor Birbal Sahni (1920), Sporne (1965), S.P. Bhatnagar and Alok Moitra (1996). Comparative account of sporophyte and gametophyte of Cycadales, Ginkgoales, Coniferales and Gnetales. General account of Pteridospermales, Pentoxylales and Cordiatales. Economic importance of Gymnosperms.

Palaeobotany: Principles of palaeobotany, Fossilization: Process, types, methods of preservation. Geological time scale and importance of fossil plants.

UNIT-II: GENERAL PRINCIPLES OF TAXONOMY (15 Periods)

Aims and Principles of taxonomy, taxonomic structure, Origin of Angiosperms: Theories, cradle of angiosperms, abominable mystery, Continental drift theory. Plant Speciation: Allopathic, Abrupt, Sympatric, Hybrid, Apomictic speciation, Isolating mechanisms. Concept of species: Typological, Evolutionary and Biological. International Code of Botanical Nomenclature: Salient features, Principles, Important Rules and Recommendations, Provisions, Appendices.

UNIT-III: PLANT SYSTEMATICS (15 Periods)

Comparative account of various systems of classification of angiosperms proposed by Linnaeus, Bentham and Hooker, Engler and Prantl, Cronquist and APG-IV system. Study of comparative account of following Angiospermic families- Magnoliaceae, Annonaceae, Rosaceae, Caesalpiniaceae, Malvaceae, Apiaceae, Apocynaceae, Verbenaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Asteraceae, Nyctaginaceae, Euphorbiaceae, Poaceae, Cannaceae, Orchidaceae.

UNIT-IV: MODERN TRENDS IN ANGIOSPERM TAXONMY (15 Periods)

Taxonomic evidences and techniques used in- **Chemotaxonomy**: Origin of chemotaxonomy, classes of compounds and their taxonomical significance, techniques **Numerical taxonomy:** Principles, Operational taxonomic Units (OTU), construction of taxonomic groups, cluster analysis and applications. **Molecular Systematics:** Molecular techniques, restriction

fragment length polymorphism (RFLP's), Random amplified polymorphic DNA (RAPD), applications of molecular systematics. **Biosystematics:** steps, categories and importance of bio systematic studies.

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BOTANY
LABORATORY COURSE WORK: BASED ON THEORY PAPER – III
(Annual Pattern)

Practical Exercises:

1. Study of Morphology, Internal Structure (Double stained Slide Preparation) and
2. Reproductive Structure of *Thuja* and *Ephedra.*
3. Study of Morphology, Internal Structure (Double stained Slide Preparation) and
4. Reproductive Structure of *Araucaria* and *Ginkgo.*
5. Study of Morphology, Internal Structure (Double stained Slide Preparation) and
6. Reproductive Structure of *Taxus* and *Gnetum.*
7. Study of Fossil Gymnosperms with the help of Slides / Specimens.
8. Description and identification of at least two plant species belonging to Family – Magnoliaceae, Annonaceae with their floral formulae and floral diagrams
9. Description and identification of at least two plant species belonging to Family – Rosaceae, Caesalpiniaceae with their floral formulae and floral diagrams
10. Description and identification of at least two plant species belonging to Family – Malvaceae, Apiaceae with their floral formulae and floral diagrams
11. Description and identification of at least two plant species belonging to Family – Apocynaceae, Verbenaceae with their floral formulae and floral diagrams
12. Description and identification of at least two plant species belonging to Family – Acanthaceae, Rubiaceae with their floral formulae and floral diagrams
13. Description and identification of at least two plant species belonging to Family – Cucurbitaceae, Asteraceae with their floral formulae and floral diagrams
14. Description and identification of at least two plant species belonging to Family – Nyctaginaceae, Euphorbiaceae with their floral formulae and floral diagrams
15. Description and identification of at least two plant species belonging to Family – Poaceae, Cannaceae with their floral formulae and floral diagrams
16. Description and identification of at least two plant species belonging to Family – Orchidaceae with their floral formulae and floral diagrams
17. Field trips within and around the campus for study of local flora.
18. At least one Botanical excursion, compilation of field notes and preparation of wild and cultivated plants as are abundant

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SEMESTER – I

BOTANY

***THEORY PAPER-IV: PLANT ANATOMY & DEVELOPMENTAL BIOLOGY**

(Elective)

Periods: 60 Credits: 04

Learning Objectives

1. To study and impart knowledge about the plant anatomy, embryology and palynology of angiosperms.
2. To inspire students to study internal structure and development of plant.

Learning outcomes:

1. Understand the anatomy, embryology and palynology of angiosperms.
2. Learn the applied aspects of palynology, embryology and anatomy.

UNIT-I: PLANT ANATOMY- I (15 Periods)

Introduction, importance and scope of histology and anatomy of plants. Types of meristemOrganization of root apical meristem (RAM), Lateral root and root hairs. Organization of Shoot Apical Meristem (SAM). Types of vegetative shoot apex. Cytological and molecular aspects of SAM. Vascular tissue differentiation- Xylem and phloem. Primary and secondary growth: stem and root. Wood development in relation to environmental factors.

UNIT-II: PLANT ANATOMY- II (15 Periods)

Development, types and phyllotaxy of leaf, Leaf structure with reference to C3 and C4 plants, Kranz anatomy, Structure and types of stomata and trichomes. Floral meristem and floral development in *Arabidopsis* and *Antirrhinum*, Vascular anatomy of flower, Inferior ovary, transition to flowering, Role of floral anatomy in taxonomy. Secretary tissues: types and functions.

UNIT-III: PLANT DEVELOPMENT (15)

Gametophyte in Angiosperms: outline and types of development of male and female gametophyte. Ultrastructure of gametophyte: Vegetative cell, generative cell, pollen wall, pollen tube, abnormal male gametophyte and their function. Ultrastructure of female gametophyte: Synergids, Eggs, antipodal, central wall. Double Fertilization and triple fusion. Development, types and functions of endosperm, Development and types of embryo. Polyembryony and apomixes, experimental embryology.

UNIT-IV: PALYNOLOGY (15)

Importance and scope of palynology, Application of palynology in oil exploration and forensic science. Pollen morphology and NPC classification. Palynotaxonomy- Role of palynology in taxonomy, **Palaeopalynology**- Principles, Aeropalynology- Principles, techniques of pollen analysis, pollen calendar its importance, allergic properties of pollen, Agropalynology- pollen viability, pollen germination, pollen storage and their significance.

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LABORATORY COURSE WORK: BASED ON THEORY PAPER – IV
(Annual Pattern)

Practical Exercises:

1. Study of root and shoot apical meristems with the help of permanent slides.
2. Study of epidermal peels for stomatal types / stomatal index
3. Study of trichomes
4. Study of Leaf phyllotaxy in plants
5. Study of leaf anatomy in C3 and C4 plants.
6. Study of secretary tissues with the help of permanent slides
7. Study of Xylem elements by maceration technique
8. Preparation and staining of slides for the study of floral anatomy by microtome technique.
9. Microscopic examination of Pollengrains by Chitale technique.
10. Pollen viability test by using tetrazolium salts
11. Pollen germination test hanging drop / sitting drop cultures,/ suspension culture or surface culture.
12. Study of monosporic, bisporic and teltrasporic types of embryo sac development through examination of permanent stained serial sections.
13. Study of nuclear cellular endosperm through dissections and staining.
14. Field study of several types of flower with different pollination mechanisms (wind pollination, Bat pollination, bee/butterfly pollination, bird pollination).
15. One long and two short botanical excursion arranged by the department.

M. Sc. FIRST YEAR
SEMESTER – I
BOTANY
PAPER-I

SELECTED READINGS:

1. Vashishta B.R. (1990) Botany for Degree Students Part-I Algae, S. Chand & Co. New Delhi.
2. Vashishta B.R. (1990) Botany for Degree Students Part-II Fungi, S. Chand & Co. New Delhi.
3. Alexopolous C.J. & C.W. Mims (1979) Introductory Mycology Wiley Eastern Ltd., New Delhi
4. Smith G.M. (1971) Cryptogamic Botany Vol-I. Algae and Fungi, Tata McGraw Hill Publishing Co. New Delhi.
5. Dubey H.C. (1990) An Introduction to Fungi, Vikas Publishing House, New Delhi.
6. Sharma P.D. (1995) The Fungi, Rastogi & Co., Meerut.
7. Sharma O.P. (1992) A Text Book of Thallophytes, Tata McGraw Hill Publishing Co. New Delhi.
8. Fritsch F.E.(1945) The Structure and Reproduction of Algae Vol-I & II. Cambridge University Press.
9. Chapman V.J. and D.J. Chapman (1962) The Algae, English Language Book Society McMillan, London.
10. Mehrotra R.S. and K.R.Aneja (1990) Introduction to Mycology, Wiley Eastern Ltd. New Delhi.
11. Pandey S.N.,P.S. Trivedi and S.P. Mishra. A Text Book of Botany Vol-I & II Vikas Publishing House, New Delhi.
12. Pandey B.P. (2000) College Botany Vol-I (Algae, Fungi, Bryophytes) S. Chand & Co. New Delhi.
13. Pandey B.P. (2000) College Botany Vol-II (Pteridophyta, Gymnosperms, Paleobotany) S. Chand & Co. New Delhi.
14. Clintion A (1958) Introduction to Bacteria McMillan, New York.
15. Bower F.O. (1988) Primitive Land Plants Vol-I & II, Arihant Publishers, Jaipur.
16. Gangule H.C. & Kar A.K. (1995) College Botany Vol-II, New Central Book Agency, Calcutta.
17. Rajan S. Sundra (1995) College Botany Vol-I & II Himalaya Publication House.
18. Saxena A.K.& Sarabhai R.P. (1968) Text Book of Botany Vol-I Ratan Prakashan Mandir, Agra.
19. Saxena A.K. & Sarabhai R.P. (1968) Text Book of Botany Vol-II Ratan Prakashan Mandir, Agra.

M. Sc. FIRST YEAR
SEMESTER – I
BOTANY
PAPER-II

SELECTED READINGS:

1. Smith G.M. (1971) Cryptogamic Botany Vol-II Bryophytes and Ptridophytes. Tata McGraw Hill Publishing Co. New Delhi.
2. Sharma O.P. (1992) A Text Book of Pteridophytes Tata McGraw Hill Publishing Co. New Delhi.
3. Vashishta B.R. (1990) Botany for Degree Students Part-III Bryophyta, S. Chand & Co. New Delhi.
4. Vashishta B.R. (1990) Botany for Degree Students Part-II Algae, S. Chand & Co. New Delhi.
5. Puri P. (1980) Bryophyta Atmaram & Sons. New Delhi.
6. Parihar N.S. (1965) An Introduction to Embryophyta Vol-I Bryophyta Central Book Depot, Allahabad.
7. Vashishta P.C. (1991) Botany for Degree Students Part-V Vascular Cryptogams (Pteridophyta), S. Chand & Co. New Delhi.
8. Parihar N.S. (1965) An Introduction to Embryophyta Vol-II Pteridophyta Central Book Depot, Allahabad.
9. Sharma O.P. (1992) A Text Book of Pteridophytes McMillan (India) Ltd
10. Rashid A (1976) An Introduction to Pteridophyta Vikas Publishing House, New Delhi
11. Sporne K.R. (1976) The Morphology of Pteridophytes B.I. Publication, Bombay
12. Pandey B.P. Text book of Botany Gymnosperms S. Chand & Co. Ltd. New Delhi.
13. Biswas C. B. M. Johri The Gymnosperms Narosa Publishing House, New Delhi.

M. Sc. FIRST YEAR
SEMESTER – I
BOTANY
PAPER-III

SELECTED READINGS:

1. Davis P. H. and Heywood V.H. (1993) – Principles of Angiosperms Taxonomy Tobert E. Kreigher Pub. Co. New York
2. Grant. V. (1971) – Plant Speciation – Columbia University Press New York.
3. Harrison, H.J. (1971) – New concepts in flowering plant Taxonomy – Hieman Educational Books Ltd. London
4. Heslop – Harrison J. (1967) – Plant Taxonomy- English Language Book Soc. and Edward Arnold Pub. Ltd. UK.

5. Hey wood. V.H. and Moore D.M. (1984) – Current concepts in plant Taxonomy, Academic press, London.
6. Jones A.D. and Wilbins, A.D. (1971) – Variation and adaptations in plant species. Hieman & Co-Educational Books Ltd. London.
7. Jones S.B. Jr. and Luchsinger, A.E. (1986) – Plant systmatics (2nd edition) Mc Graw Hill Book Co., New York.
8. Nordenstam, B.EL Gazaly, G. and Kassas, M. Zoo – Plant systematic for 21st Century. Portland press Ltd. London.
9. Radford, A.E. (1986) – Fundamentals of plant systematics – Harper & Row Publications, USA.
10. Stebbins G.L. (1974) – Flowering plant Evolution Above species level – Edward Arnold Ltd., London.
11. Plant Taxonomy and Bio Systematics (2nd, edition) – Edward Arnold Ltd. London
12. Takhtajan A.L. (1997) Diversity and classification of flowering plant – Colubia University, press New York.
13. Woodland, D.W. (1991) – Contemporary plant systematics : Pentice Hall, New Jersey.
14. Flora of Osmanabad – V. N. Naik.
15. Flora of Marathwada – Chief Ed. By Dr. V.N. Naik.

M. Sc. FIRST YEAR
SEMESTER – I
BOTANY
***PAPER-IV (Elective)**

SELECTED READINGS:

1. Tayal M.S. (1983 Plant anatomy Rastogi Publication, Meerut.
2. Pandey B.P. (1993) Plant anatomy S. Chand & Co. Pvt. Ltd.
3. Saxena A.K., & Atext book of Botany Kitab Ghar, Gwaliar
4. R.P.Sarabhai (1975) Vol – II Embryophyta Pergamon Press Oxford.
5. Singh v, Pande P.C. D.K. Jain (1994) Anatomy of seed plants. Rastogi Publication, Meerut.
6. Esau K (1977) Anatomy of seed plants John Wiley & Sons, New York
7. Eames A.J. & L.H. MacDaniel (1974) Introduction to plant anatomy, Mc Graw Hill Book Co. New York.
8. Maheswari P. (1972) An introduction to embryology of Angiosperms, Tata Mc Graw Hill Pub. Co. Ltd. New York.
9. Bhojwani S.S. & Bhatnagar S.P.(1974) Embryology of Angiosperms Vikas Publication House, Pvt. Ltd. New Delhi.

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JUNE, 2019

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SEMESTER – II

BOTANY

THEORY PAPER-VI: BIOINSTRUMENTATION AND METHODS IN BIOLOGY

Periods: 60 Credits: 04

Learning Objectives

1. To know working hazards and safety measures in laboratory
2. To know principles and applications of various laboratory equipments

Learning outcomes:

1. Understand the actual working and applications of different laboratory equipments
2. Learn the various techniques used in life sciences and their utility.

Unit –I: Microscopic and Staining Techniques (15 Periods)

Introduction: Safe use of laboratory equipments, Personal protection, Hazards and waste disposal. **Microscopy**-Working and application of simple microscope, compound microscope, Dark field microscope, phase contrast microscope, fluorescence microscope, scanning and transmission electron microscope, Micrometry, flow cytometry, Microtomy-material selection, block designing, fixation, cutting and staining.

Unit-II: Chromatographic and sterilization Techniques (15 Periods)

Principle and applications of Paper chromatography, Thin layer chromatography and Column chromatography. Gel filtration, Ion exchange, affinity chromatography, Gas chromatography, HPLC, HPTLC. Principles, working and applications of Laminar air flow, Autoclave, Hot air oven, Incubator and pH Meter. Sterilization by filtration methods.

Unit –III: Spectroscopic and Radioactive Techniques (15 Periods)

Beer-Lamberts Law, Principles and techniques of colorimeter, UV-Visible spectrophotometer, fluorescence spectroscopy, NMR, Atomic absorption Spectrometry and plasma emission spectroscopy. X-ray diffraction, Radioactive isotopes and half life of isotopes, autoradiography, effect of radiations on biological systems, units of radioactivity, uses of radioisotopes in life sciences & biotechnology, detection and measurement techniques, liquid scintillation counting, solid state counting- Geiger counter - Radiation hazard & laboratory handling methods.

Unit - IV: Electrophoretic and Centrifugation techniques (15 Periods)

Electrophoresis: Principle and applications, Types- paper, gel- agarose, PAGE, pulsed field, capillary, isoelectric focusing, 2 D Electrophoresis, RFLP, RAPD and AFLP techniques.

Blotting techniques: western, southern & northern, methods and applications in life sciences.

Centrifugation: Principle and Applications of centrifugation techniques, Designs of rotors, Bench top, Low speed, High speed, Cooling, Ultracentrifuge.

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LABORATORY COURSE WORK: BASED ON THEORY PAPER – VI
(Annual Pattern)

Practical Exercises:

1. Study of Principle and working of laminar air flow, Autoclave, Incubator, Hot air Oven
2. Sterilization of Media/Glassware with the help of autoclave and hot air oven.
3. Study the principle and working of Simple and Compound microscope.
4. Demonstration of microscopes (phase contrast, fluorescence, SEM, TEM)
5. Calibration of Microscope and measurement of microorganisms
6. Micrometry of pollen grains
7. Microtome section cutting and staining technique
8. Separation of amino acids by paper chromatography or paper electrophoresis
9. Separation of chlorophyll pigments by Paper or thin layer chromatography.
10. Detection of plant proteins by Polyacrylamide Gel Electrophoresis
11. Study the principle and working of pH meter and measurement of pH of soil / solutions.
12. Analysis of DNA and RNA by one and two dimensional gel electrophoresis
13. Visit to research centre (CCMB, NCL, CFTRI, ICRISAT, and BARC), Biotechnology/ Tissue culture laboratories, Agriculture Universities, Pharmaceutical industries etc.

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THEORY PAPER-VII: CELL BIOLOGY, GENETICS AND PLANT BREEDING

Periods: 60 Credits: 04

Learning Objectives

1. To understand basic aspects of cell, cell organelles.
2. To know various basic aspects and techniques used in genetics and plant breeding.

Learning outcomes:

1. Understand the structural organization and functions of cell and cell organelles.
2. Able to understand Gene structure, linkage groups, Genetic inheritance and extra chromosomal inheritance in plants.
3. Understand basic techniques of hybridization.

Unit-I: CELL BIOLOGY-I (15 Periods)

Structure and function of prokaryotic and eukaryotic cells, Structural organization and function of Cell wall, Mitochondria, Vacuoles, Chloroplast, ER, Golgi Complex, Lysosome and Nucleus. Chromosome- structure and function; Heterochromatin and Euchromatin. Cell division and cell cycle- Mitosis, Meiosis, regulation and control of cell cycle. Structure and function of cytoskeleton. Membrane structure and function- lipid bilayer and membrane protein. Cell signaling and cell receptors, G-Protein Coupled Receptor, signal transduction.

Unit-II: GENETICS-I (15 Periods)

Introduction to pre Mendelian, Mendelian and Post Mendelian genetics. Complementary, epitasis, inhibitory, Duplicate, Polymeric, Lethal and additive interaction of genes. Crossing over- Types, mechanism and significance. Linkage – Types of linkage, deletion of linkage, Linkage map, linkage groups, map distance, gene order, interference and coincidence, Sex linked inheritance, sex determination and molecular basis of sex differentiation. Chromosome: physical or cytological mapping, Characters of multiple alleles; examples: A, B, AB and O blood groups in humans, Rh factor.

Unit-III: GENETICS-II (15 Periods)

Gene structure and regulation of gene expression, Extra chromosomal inheritance (Episomes, Mitochondria and Chloroplasts), Transposons, Karyotype. Chromosomal aberrations-deletions, duplication, inversion, translocation, variation in chromosome morphology. Dosage Compensation, Population genetics: Concepts of a population and gene pool, Hardy-Weinberg law and its application in calculating gene frequencies in a population, Factors affecting Hardy Weinberg equilibrium (selection, mutation, migration and genetic drift) C-value paradox, B chromosomes.

Unit-IV: PLANT BREEDING (15 Periods)

Pre and post Mendelian development, objectives, Genetic basis of breeding, Plant breeding in India. Sexual reproduction (Cross and self pollination), asexual reproduction, Imcompatibility and Male sterility, their types, mechanisms and applications in plant breeding. Hybridization

and its role, Inter-varietal and wide crosses. Principles of combination breeding and its application. Hybrid breeding in self and cross pollinated crops. Heterosis, Inbreeding depression. Concepts, types of mutation, physical and chemical mutagens, their mechanism of action, molecular basis of gene mutations, Role of mutations in Plant Breeding.

M. Sc. FIRST YEAR
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LABORATORY COURSE WORK: BASED ON THEORY PAPER – VII
(Annual Pattern)

Practical Exercises:

1. Study of different stages of mitosis and determination of mitotic index in Allium/ Aloe/ Chlorophytum/ Pea
2. Study of mitotic abnormalities in Allium cells by chemical treatments.
3. Study of different stages of meiosis and meiotic irregularities in Allium and Rhoeo/ Tradeschantia
4. Isolation of Mitochondria from eukaryotic cell
5. Isolation of Chloroplasts from plant cell
6. Study of ultramicroscopic structures of cell organelles with the help of Photographs (Golgi apparatus, Ribosomes,Chloroplast,Mitochondria E.R. and Nucleus,)
7. Study of mutation in Yeast/Bacteria by replica plate technique.
8. Study of Karyotype and ideogram in plants/ human
9. Determination of blood grouping
10. Problems based on Gene interaction
11. Problems based on Multiple alleles.
12. Problems based on Gene mapping
13. Problems based on linkage
14. Problems based on Hardy Weinberg equation
15. Emasculation and bagging of flowers of Brasicaceae, Malvaceae, and liliaceae, pollinating them manually and estimating fruit and seed set.
16. Visit to research institutes / Biotechnology/ Tissue culture laboratories / Agriculture Universities

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BOTANY

THEORY PAPER-VIII: PLANT RESOURCE UTILIZATION & BIODIVERSITY CONSERVATION

Periods: 60 Credits: 04

Learning Objectives

1. To know economic importance of plant wealth
2. To know principles and strategies of Biodiversity and its conservation.
3. To study role of various organization in sustainable development

Learning outcomes:

1. Study of origin, cultivation and economic importances of various plant wealth
2. Learn the importance of biodiversity and motivation of students for its conservation

Unit-I: PLANT RESOURCE UTILIZATION (15 Periods)

Domestication and introduction of plants, origin of cultivated plants, Vavilov's centers of origin. Plants as source of food, fodder, fibre, spices, beverages, edible oils, drugs, narcotics, insecticides, timber, gums, resins, dyes, latex, cellulose, starch, Medicinal and Aromatic plants. Plants as source of renewable energy. Role of biotechnology in agriculture, medicine, industry and green house technology.

Unit-II: BIODIVERSITY (15 Periods)

Concept of Biodiversity: Species diversity, Genetic diversity, Ecosystem diversity. Origin, values and Threats to Biodiversity. Biodiversity and agriculture; Biodiversity and food diversity. Bioprospecting. Biodiversity in India, Endemism: Concept and types, endemic and endangered species of India, Hot spots- Global and Indian. IUCN categories, Red data book, Convention on Biological Diversity (CBD).

Unit-III: CONSERVATION-I (15 Periods)

Green revolution- Benefits and adverse consequences, Principles of conservation, major approaches to conservation and current practices in conservation of genetic diversity, species diversity, ecosystem diversity. Conservation strategies – In-situ conservation, Project tiger, biosphere reserves, sanctuaries, National parks, Mangroves, on-farm and home garden conservation. Indian case studies on conservation strategies.

Unit-IV: CONSERVATION-II (15 Periods)

Conservation strategies – Ex-situ conservation, principles and practices, germ plasm collections, Botanic gardens, seed banks, test tube gene banks, pollen banks, cryobanks, ex-situ conservation of microbes. Social approaches to conservation- sacred groves, sthalavrikshas. Peoples movement for biodiversity conservation- Chipko movement, river dam and tribal campaign. Role of universities and other educational institutions in biodiversity conservation. Role of BSI, NBPGR, ICAR, CSIR and Department of Biotechnology in sustainable development.

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w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR

BOTANY

LABORATORY COURSE WORK: BASED ON THEORY PAPER – VIII

(Annual Pattern)

Practical Exercises:

1. Methods of Cultivation, harvesting and economic importance of food, fodder plants.
2. Methods of Cultivation, harvesting and economic importance of vegetable, fruits, spices and oil yielding plants.
3. Qualitative tests for carbohydrates, proteins and starch from given materials-cereals, pulses, oils/fats, spices.
4. Study of morphology, anatomy, microscopic study of whole fiber using appropriate stain of textile fibers (cotton, jute) cordage fiber (coir).
5. To estimate the reducing and non-reducing sugars from different fruit juices and food materials.
6. Study of medicinal uses and properties of (Neem, Adhatoda, Ocimum, Garlic Aloe,)
7. Study of medicinal uses and properties of (Mentha, Withania, Asparagus, Brahmi)
8. Determination of chemical nature of gums, resins, dyes, by Performing simple chemical test.
9. Determination of chemical nature of Narcotics, insecticides, & beverages by Performing simple chemical test.
10. To estimate protein from food materials by suitable method.
11. To estimate carbohydrates from food materials by suitable method.
12. Case studies on conservation strategies for plants in India.
13. Scientific visits to Biosphere reserves, National parks, Sanctuary, A mangrove forests, NBPGR New Delhi or its regional circles, Head quarters of BSI or one of its regional circles.
14. Scientific visits to CSIR laboratories, doing research on plant utilization, ICAR research station or field station, Recognized botanical garden/museum (FRI Dehradun, NBRI Lucknow.

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w. e. f. Academic Year 2019-2020

M. Sc. FIRST YEAR

SEMESTER – II

BOTANY

*THEORY PAPER-IX: PLANT ECOLOGY, ENVIRONMENTAL BIOLOGY AND PHYTOGEOGRAPHY (ELECTIVE)

Periods: 60 Credits: 04

Learning Objectives:

1. Acquainted with basic concepts of Ecology, Ecosystem, and phytogeography
2. To learn basic aspects of recent problems related to enviormental biology

Learning outcomes:

1. Able to understand the ecological principles, structure and functions of ecosystem.
2. Learn about the causes of environmental pollution and its control measures.
3. Learn about different phytogeographic regions and their vegetation pattern.

Unit-I: ECOLOGY (15 Periods)

Introduction- Scope and importance of ecology in India, Ecological tools and techniques, Sampling techniques of population, methods of estimating primary production and consumer production. Ecosystems - Concepts of ecosystem, Function of Ecosystem – Energy flow and mineral cycling (C, N, P), Structure and function of some Indian ecosystems – Terrestrial ecosystem (Grassland and Forest ecosystem), Aquatic ecosystem (Fresh water, marine and estuarine ecosystem), Food chains, Food webs and ecological pyramids.

Unit-II: POPULATION ECOLOGY (15 Periods)

Characterization of a population, population growth curves, population regulation, life history strategies (Y and K selection), Concepts of metapopulation- demes and dispersal, interdemic extinctions, age structured populations. Community ecology- Nature of communities, community structure, levels of species diversity and its measurement, edges and ecotones. Ecological succession – Types, mechanism, changes involved in succession, concept of climax.

Unit-III: ENVIRONMENTAL BIOLOGY (15 Periods)

The Environment – Physical and biotic environment, biotic and abiotic interactions. Environmental pollution – Causes, effects and control measures of air, water, soil and thermal pollution, Nuclear hazards, phytoremediation, Global warming and climate change, acid rains, ozone layer, ozone hole. Social issues and the environment – EPA 1986, Urban problems related to energy, water conservation, rain water harvesting, environmental ethics, issues and possible solutions.

Unit-IV: PHYTOGEOGRAPHY (15 Periods)

Introduction, concept, Climate and Vegetation of the world, Phytogeographical regions of World, Botanical provinces of India and their characteristic vegetation. Forest types of India. Ecological importance of forests, aforestation, deforestation, social forestry. Geological time scale and geographical history, Continental Drift, Land Bridges, shifting of poles, theories of

differentiation and natural selection, types and areas of natural distribution, centre of origin, theory of tolerance.

M. Sc. FIRST YEAR
BOTANY

LABORATORY COURSE WORK: BASED ON THEORY PAPER – IX
(Annual Pattern)

Practical Exercises:

1. To calculate mean, variance, standard deviation, standard error, coefficient of variation and to use test for comparing two means related ecological data.
2. To find out the relationship between two ecological variables using correlation and regression analysis.
3. To study the vegetation by Line Transect method
4. To determine minimum size and number of quadrates required for reliable estimate of biomass in grassland.
5. To determine IVI of the species in grass land using suitable method & state whether vegetation is homogeneous or heterogeneous.
6. To determine gross and net phytoplankton productivity by light & dark bottle method.
7. To determine the soil carbonates by rapid titration method.
8. To find out association between important grassland species using Chi-square test.
9. To determine the water holding capacity of soils collected from different locations.
10. To determine percent organic carbon and organic matter in the soils of cropland, grassland & forest
11. To estimate the dissolved oxygen content in eutrophic and oligotrophic water samples by Winkler's method.
12. To determine the biochemical oxygen demand (BOD) of polluted water.
13. Field visit to study different forest types of India.

SELECTED READINGS:

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7. Research Experiences in plant physiology.-A Laboratary Mannual Thomas C. Moore Spinger-Verlag,Berlin.
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CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science

Post Graduate (PG) Programmes

BOTANY - CURRICULUM

w. e. f. Academic Year 2019-2020

SKELETON QUESTION PAPER

M. Sc. FIRST YEAR, SEMESTER – I & II

BOTANY

Maximum Marks: 75

Credits: 03

Time: 03 Hours

Note:

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

Q1. Long answer type question (Based on Unit-I) (15)

OR

a. Short answer type question (Based on Unit-I) (08)

b. Short answer type question (Based on Unit-I) (07)

Q2. Long answer type question (Based on Unit-II) (15)

OR

a. Short answer type question (Based on Unit-II) (08)

b. Short answer type question (Based on Unit-II) (07)

Q3. Long answer type question (Based on Unit-III) (15)

OR

a. Short answer type question (Based on Unit-III) (08)

b. Short answer type question (Based on Unit-III) (07)

Q4. Long answer type question (Based on Unit-IV) (15)

OR

a. Short answer type question (Based on Unit-IV) (08)

b. Short answer type question (Based on Unit-IV) (07)

Q5. Write short notes on any three of the following (15)

1. (Based on Unit-I)
2. (Based on Unit-II)
3. (Based on Unit-III)
4. (Based on Unit-IV)

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SKELETON OF PRACTICAL QUESTION PAPER

M. Sc. FIRST YEAR, SEMESTER – I

BOTANY

LABORATORY COURSE WORK-I: BASED ON THEORY PAPER – I & II

Maximum Marks: 75

Credits: 03

Time: 06 Hours

Note: (i) Attempt all questions

(ii) Draw neat and well labeled diagrams wherever necessary

Q1.	Major question		20
Q2.	Minor question		10
Q3.	Major question		20
Q4.	Minor question		10
Q5.	i)	Record book	07
	ii)	Viva voce	05
	iii)	Submission	03

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CHOICE BASED CREDIT SYSTEM (CBCS)

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SKELETON OF PRACTICAL QUESTION PAPER

M. Sc. FIRST YEAR, SEMESTER – I

BOTANY

LABORATORY COURSE WORK-II: BASED ON THEORY PAPER – III & IV

Maximum Marks: 75

Credits: 03

Time: 06 Hours

Note: (i) Attempt all questions
(ii) Draw neat and well labelled diagrams wherever necessary

Q1.	Major question		20
Q2.	Minor question		10
Q3.	Major question		20
Q4.	Minor question		10
Q5.	i)	Record book	07
	ii)	Viva voce	05
	iii)	Submission	03

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science

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BOTANY - CURRICULUM

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SKELETON OF PRACTICAL QUESTION PAPER

M. Sc. FIRST YEAR, SEMESTER – II

BOTANY

LABORATORY COURSE WORK-III: BASED ON THEORY PAPER – VI & VII

Maximum Marks: 75

Credits: 03

Time: 06 Hours

Note: (i) Attempt all questions
(ii) Draw neat and well labelled diagrams wherever necessary

Q1.	Major question		20
Q2.	Minor question		10
Q3.	Major question		20
Q4.	Minor question		10
Q5.	i)	Record book	07
	ii)	Viva voce	05
	iii)	Submission	03

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science

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BOTANY - CURRICULUM

w. e. f. Academic Year 2019-2020

SKELETON OF PRACTICAL QUESTION PAPER

M. Sc. FIRST YEAR, SEMESTER –II

BOTANY

LABORATORY COURSE WORK-IV: BASED ON THEORY PAPER – VIII & IX

Maximum Marks: 75

Credits: 03

Time: 06 Hours

Note: (i) Attempt all questions

(ii) Draw neat and well labelled diagrams wherever necessary

Q1.	Major question		20
Q2.	Minor question		10
Q3.	Major question		20
Q4.	Minor question		10
Q5.	i)	Record book	07
	ii)	Viva voce	05
	iii)	Submission	03

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