॥ सा विद्या या विमुक्तये ॥

# स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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

# SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

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

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

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील खालील विषयाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२४–२०२५ पासून लागू करण्याबाबत.

## प रि प त्र क

या परिपत्रकान्वये सर्व संबधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील C.B.C.S. (Choice Based Credit System) Pattern नुसारचे खालील अभ्यासक्रम शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्यास मा. विद्या परिषदेच्या दिनांक १५ मे २०२४ रोजीच्या बैठकीतील ठराव क्रमांक १५/५९–२०२४ अन्वये मान्यत प्रदान केली आहे.

1. B.Sc. Seed Technology II year

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

विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शैक्षणिक– /०१/परिपत्रक/UG/
पदवी–सीबीसीएस अभ्यासक्रम/२०२४–२५/174
दिनांक : २५.०७.२०२४

आपली विश्वासू
डॉ. सरिता लोसरवार
सहाय्यक कुलसचिव

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना देवून कळवण्यात येते की, सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसिध्द करण्यात यावे.

# SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

**SEMESTER PATTERN CURRICULUM UNDER**

**CHOICE BASED CREDIT SYSTEM (CBCS)**
**for**
**Faculty of Science and Technology**
**Under Graduate Program**

**SUBJECT: SEED TECHNOLOGY**

## B. Sc. Second Year

**With Effect from June 2020**

## Introduction:

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in the curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

Swami Ramanand Teerth Marathwada University has 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. University had implemented Choice Based Credit System (CBCS) pattern at UG level from the academic year 2016-2017 progressively.

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. Presently there is wide diversity in the curriculum of different Indian Universities which inhibited mobility of students in other universities or states. To ensure uniform curriculum at UG level , 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 CBCS provides choice for students to select from the prescribed courses .The choice based credit system provides a ‘cafeteria’ type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our university has already introduced the choice based credit system. The semester system accelerates the teaching-learning process and enables vertical and horizontal mobility in learning.

Keeping in mind BoS in Botany prepared the curriculum to ensure up-to-date level of understanding of plant sciences. Studying plant sciences prepares the students for a career working either in an educational institution or an industry in which they can be directly involved in the research and development and Knowledge of modern and applied plant science and excellent career prospects.

The study of Seed Technology aims to expand and increase current knowledge about plants in order to solve problems in many fields including Agriculture, Plant Physiology, Plant Biotechnology, Genetics and Plant Breeding, Seed Pathology, Seed Biology, etc are some of the

objectives kept in mind during executing the syllabus.

The addition of Skill enhancement courses aims to develop skills in plant sciences and practical experience in the students.

At the end of the curriculum, the student should have increased: an aptitude towards science and nature and also undertakes the fundamental and applied research in plant science in the benefit of the human and nature.

At last comments, suggestions are welcome from all the teachers, stakeholders and students for the upbringing the curriculum.

## Salient Features:

The syllabus of B.Sc. S.Y. Seed Technology has been framed to meet the requirement of Choice Based Credit System. The courses offered here Plant Physiology, Plant Biotechnology, Genetics and Plant Breeding, Seed Pathology and Seed Biology, etc. will train and orient the students in the specific fields of Seed Technology. This would help students to lay a strong foundation in the field of Seed Technology.

Overall after completion of this course, students will also acquire fundamental knowledge in Plant Science and also understand that Seed Technology is an integral part of the human life and developments.

Skill Enhancement Courses offered during third year of this program are being designed with the aim of imparting specific skills to the students which will lead to the self-employability through development of their own enterprises.

## Program Educational Objectives:

**The Objectives of this program are:**

**PEO1:** To promote the possibility of self-employment after BSc / MSc Seed Technology.

**PEO2:** To bridge up the gap between knowledge based conventional education and market demands and to provide an alternative to those pursuing higher education.

**PEO3:** To enrich students' training and knowledge that would be useful in the seed industry so that the farmers will get quality seeds.

**PEO4:** To introduce the concepts of experimental design in Seed Technology.

**PEO5:** To inculcate sense of job responsibilities, while maintaining social and environment awareness.

**PEO6:** To help students build-up a progressive and successful career in industries with a biotechnological perspective.

## Program Outcomes:

**The Outcomes of this program are:**

**PO1:** Through this course, skilled and technical human resources will be made available to the seed industries so that the farmers will get quality seeds.

**PO2:** Students will be acquainted with the fields like plant morphology, plant protection, plant pathology, seed entomology, plant biotechnology, plant breeding, seed production, seed processing, seed treatments, seed storage, seed marketing etc.

**PO3:** It will develop self-confident and knowledgeable personnel's.

**PO4:** The course will motivate students in the field of research as well as guide to become a successful entrepreneur.

**PO5:** It will develop self-awareness to enrich decision making ability among the students.

**PO6:** Personal development will increase the clarity and effectiveness in knowing themselves and their strengths.

**Prerequisite**:

The optional courses are offered to the students registered for undergraduate programs. Such students should have the basic knowledge of Plant Science and willing to gain additional knowledge in the field of Seed Technology.

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

## SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

### SEMESTER PATTERN CURRICULUM UNDER

### CHOICE BASED CREDIT SYSTEM (CBCS) FOR
### Under Graduate Course
### Faculty of Science and Technology
### SUBJECT: SEED TECHNOLOGY

**CLASS: B.Sc. SECOND YEAR**

An Outline:

| Semester/ Annual | Course No. | Course Name | Instructi-onal Hrs/week | Total Periods | Marks for | | Credits (Marks) |
|---|---|---|---|---|---|---|---|
| | | | | | Internal (CA) | External (ESE) | |
| **Semester-III** | **CCB-III (Section-A)** | **Theory Paper-VI:** Fundamentals of Genetics | 03 | 45 | 10 | 40 | Credits: 02 (Marks:50) |
| | **CCB-III (Section-B)** | **Theory Paper-VII:** Crop Improvement – I *(Kharif Crops)* | 03 | 45 | 10 | 40 | Credits: 02 (Marks:50) |
| **Semester-IV** | **CCB-IV (Section-A)** | **Theory Paper-VIII:** Fundamentals of Plant Biochemistry and Biotechnology | 03 | 45 | 10 | 40 | Credits: 02 (Marks:50) |
| | **CCB-IV (Section-B)** | **Theory Paper-IX:** Crop Improvement –II *(Rabi Crops)* | 03 | 45 | 10 | 40 | Credits: 02 (Marks:50) |
| **Annual Pattern** | **CCBP-II** | **Practical Paper-X:** Practicals based on CCB-III (Section-A) CCB-IV (Section-A) | 03 | 16 Practicals | 10 | 40 | Credits: 02 (Marks:50) |
| | **SECB-I** | SEC- I A Seed Processing Technology OR SEC-1 B Seed Quality Testing | 03 | 45 | 25 | 25 | Credits: 02 (Marks:50) |
| **Annual Pattern** | **CCBP-III** | **Practical Paper-XI:** Practicals based on CCB-III (Section-B) CCB-IV (Section-B) | 03 | 16 Practicals | 10 | 40 | Credits: 02 (Marks:50) |
| | **SECB-II** | SEC- II A Emerging Trends in Seed Quality Enhancement OR SEC-II B Seed Health Management | 03 | 45 | 25 | 25 | Credits: 02 (Marks:50) |
| Total Credits Semester-III and IV | | | | | Marks: 60+50= 110 | Marks: 240+50= 290 | Credits: 12+04=16 (Marks: 300+100 =400) |

**ESE** : End Semester Examination, **CA** : Continues Assessment, **SECB**: Skill Enhancement Course Botany, **CCB**: Core Course Botany, **CCBP**: Core Course Botany Practical.

**Distribution of Credits**: 80 % of the total credits for the ESE and 20% for CA

**CA of 10 Marks (Theory):** 05 Marks for test & 05 Marks for Assignment

**CA of 10 Marks (Practical's):** 05 Marks for test & 05 Marks for Record Book, Submission of collection and field note and Excursion Report.

**CA of 25 Marks**: 15 Marks for Seminar & 10 Marks for Test

## SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

### SEMESTER PATTERN CURRICULUM UNDER

### CHOICE BASED CREDIT SYSTEM (CBCS)
### SEED TECHNOLOGY
### B.Sc. Second Year
### Semester III
### CCB-III (A)

## Theory Paper- VI

## Fundamentals of Genetics

**Periods 45** **Credits: 02**
**Maximum Marks: 50**

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**Learning Objectives:**

1. To introduce the basic concept and various aspects of Genetics.
2. To impart knowledge about Pre and post Mendelian concepts of heredity.
3. To provide basic knowledge of Sex determination and sex linkage.

**Learning Outcomes:**

1. Student gain basic knowledge regarding heredity and Cell division.
2. Student will get knowledge on Gene interaction.
3. Student will get knowledge on Linkage and its estimation.

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### UNIT I: Pre and post Mendelian concepts of heredity: (10 Period)

Pre Mendelian concepts: (500 BC -1850 A.D.), Pre formation Theory, Theory, Epigenesis, Theory of Acquired characters, Theory of Pangenes, Germplsm theory and Other, contributions during pre-Mendelian era, Mendelian Era: (1850 -1900): Contributions during Mendelian era, Post Mendelian concepts: Contributions during Post- Mendelian era and recent advances after 1900. Role of different disciplines in the advancement of Genetics. Impact of Genetics and its applications in different disciplines (Role in Agriculture).

### Unit II : Mendelian principles of heredity and Cell division: (12 Period)

Laws of Mendel, Reasons of Mendel's success, Mendelian deviations or exceptions or anomalies, Cell division: Mitosis, Meiosis: Cell: Ultra structure, Cell organelles & their functions. Types of Cell, Difference between animal cell and plant cell. Stages of mitosis and meiosis. Significance of mitosis and meiosis, Difference between mitosis and meiosis.

**UNIT III: Gene interaction, Epistasis interactions with examples: (11 Period)**

Difference and similarities between epistasis and dominance: Recessive epistasis, Dominant epistasis (Simple epistasis), Dominant Inhibitory epistasis (Inhibitory gene action), Duplicate recessive epistasis (Complementary gene action), Duplicate dominant epistasis (Duplicate gene action), Polymeric gene action, Typical dihybrid ratio.

**UNIT IV: Sex determination and sex linkage, Sex limited and sex influenced traits, Linkage and its estimation: (12 Period)**

Introduction, Importance of Sex determination, Difference between autosomes and allosomes. Sex linked characters: (Colour blindness in human being) Difference between Sex limited and sex influenced traits, Linkage and its estimation: Introduction, Features of Linkage, Phases of Linkage, Types of Linkage, Linkage and pleiotropy, Significance of Linkage.

## SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

### SEMESTER PATTERN CURRICULUM UNDER

### CHOICE BASED CREDIT SYSTEM (CBCS)
### SEED TECHNOLOGY
### B.Sc. Second Year
### Semester III
### CCB-III (B)
### Theory Paper- VII
### Crop Improvement – I (*Kharif Crops*)

**Periods 45** **Credits: 02**

**Maximum Marks: 50**

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**Learning Objectives:**

1. To make students realize how crop production practices carried out in kharif season.
2. To acquaint the students with the land preparation, seed selection and planting techniques during crop production during kharif season (June-October).
3. To know the role of different practices such as weed and pest control also get aware about harvesting and post-harvest practices carried during production.

**Learning Outcomes:**

1. Students will gain the knowledge about crop specific isolation distance mantainance.
2. Students shall learn different types land preparation according to different crops.
3. Students will learn the pre-sowing treatments of seeds which results in uniform germination.

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**UNIT-I: Centre of origin, Distribution of species & wild relative in different crops (11 periods)**

**Cereals** - Rice, Maize, Sorghum, Pearl millet, finger millet.
**Pulses** - Pigeonpea, Urdbean, Black gram, Mung bean, Cowpea, Soybean.
**Oil seed** - Groundnut, Castor, Sesame, Sunflower.

**UNIT-II: PGR and Germplasm Conservation (11 periods)**
Definition of PGR, Gene pool, Kinds of germplasm, gene pool concept, Genetic erosion, Germplasm collection and conservation, Types and methods.

**UNIT-III: Conventional Breeding methods (12 periods)**
Introduction, Mass selection, pure line selection, Pedigree method, Bulk method and backcross method along with examples of varieties. Modern innovative approaches - somatic Hybridization, transgenic breeding and marker assisted selection.

**UNIT-IV: Ideotype breeding (10 periods)**
Ideotype concept in crop improvement- Introduction, Types of ideotype, characteristics of ideotype, Major steps in ideotype breeding, Ideotype of Rice, wheat, Sorghum, practical achievements, merits and demerits. Characteristics of climate resilient crops Viz. Wheat, Sorghum, maize, soybean, cotton.

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEMESTER PATTERN CURRICULUM UNDER**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**SEED TECHNOLOGY**

**B.Sc. Second Year**

**Semester IV**

**CCB-IV (A)**

## Theory Paper- VIII

## Fundamentals of Plant Biochemistry and Biotechnology

**Periods 45** **Credits: 02**

**Maximum Marks: 50**

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**Learning Objective:**

1. To study the biochemical techniques used in enhancing seed quality and ultimately production.
2. To study the biotechnological practices efficiently utilize for enhancing seed quality and production.

**Learning Outcomes:**

3. This course will be able to demonstrate foundational knowledge in biochemistry and biotechnology.
4. Students will be able to understand the recent development in science for seed quality enhancement.

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**UNIT I: Introductory Plant Biochemistry (13 Periods)**

Importance of Biochemistry, Properties of Water, pH and Buffer, Biomolecules - Definition, types, structure, properties and its applications, Importance, classification and Structures of Carbohydrate, Lipid, fatty acids, Proteins.

**UNIT II: Carbohydrate, Lipid, Fatty Acids and Proteins (10 Periods)**

Carbohydrate: Importance and classification. Structures, Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins.

**UNIT III: Introductory Plant Biotechnology (11 Period)**

Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary and Tertiary structure. Introduction to recombinant DNA technology: PCR techniques and its applications. Organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications;

**UNIT IV: Recent Advances in Plant Biotechnology (11 Period)**

Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids somaclonal variation and its use in crop improvement Physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods Marker Assisted Breeding in crop improvement.

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEMESTER PATTERN CURRICULUM UNDER**
**CHOICE BASED CREDIT SYSTEM (CBCS)**
**SEED TECHNOLOGY**
**B.Sc. Second Year**
**Semester IV**
**CCB-IV (B)**
**Theory Paper- IX**
**Crop Improvement - II (*Rabi crops*)**

**Periods 45** **Credits: 02**
**Maximum Marks: 50**

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**Learning Objectives:**

1. To make students realize how crop production practices carried out in rabi season.
2. To acquaint the students with the land preparation, seed selection and planting techniques during crop production during rabi season (october-march).
3. To know the role of different practices such as weed and pest control also get aware about harvesting and post-harvest practices carried during production.

**Learning Outcomes:**

1. Students will gain the knowledge about crop specific isolation distance mantainance.
2. Students shall learn different types land preparation according to different crops.
3. Students will learn the presowing treatments of seeds which results in uniform germination.

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**UNIT-I: Crop Improvement in Cereals (11 periods)**

Cereals –Wheat, oat and barley - Centers of origin, Distribution of species, wild relatives, Floral biology, Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)

**UNIT-II: Crop Improvement in Pulses (11 periods)**

Pulses –Chickpea- Centers of origin, Distribution of species, wild relatives, Floral biology, Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)

**UNIT-III: Crop Improvement in Vegetable Crops (12 periods)**

Vegetable-Potato- Centers of origin, Distribution of species, wild relatives, Floral biology, Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)

**UNIT-IV: Crop Improvement in Horticultural Crops (11 periods)**

Horticultural crops-Mango, Aonla and Guava- Centers of origin, Distribution of species, wild relatives, Floral biology, Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEED TECHNOLOGY – CURRICULUM**

**B.Sc. General (Semester Pattern)**

**Choice Based Credit System (CBCS) Pattern**

**B. Sc. Second Year**

**Annual Pattern**

**CCBP-II**

**PRACTICAL PAPER-X: BASED ON THEORY PAPERS-VI & VIII**

**Maximum Marks: 50**

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**Practical Exercises:**

1. Study of cell structure.
2. Preparation of microscopic Slides of mitosis - onion root tips.
3. Preparation of microscopic Slides of meiosis – tradescantia /onion /Wheat
4. Methods of finding out the gametes and gametic recombination.
5. Methods of finding out the gametes and gametic recombination.
6. Problems on monohybrid ration and its modification.
7. Problems on dihybrid ratio and its modification.
8. Experiments on test cross and back cross.
9. Problems on probability and Chi-square test.
10. Determination of linkage and cross over analysis (though two point test cross and three point test cross data)
11. Study on sex linked inheritance in Drosophila
12. Study of models on DNA and RNA structure.
13. Preparation of solution, pH and buffers
14. Qualitative tests for carbohydrates and amino acids
15. Estimation of reducing sugars by Nelson-Somogyi method
16. Estimation of starch by Anthrone method
17. Determination of soluble protein by Folin-lowry method
18. Estimation of free amino acids by Ninhydrin method
19. Determination of total crude fat/oil by Soxhlet method

20. Determination of alpha amylase activity from germinating seed.
21. Determination of invivo nitrate reductase activity from leaf tissue.
22. Paper chromatography/ TLC demonstration for separation of amino acids.
23. TLC for separation of sugars.
24. Qualitative tests for oil
25. Amplification of genomic DNA using different primers and resolution of PCR products on agarose

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEED TECHNOLOGY – CURRICULUM**

**B.Sc. General (CBCS Pattern)**

**Skeleton Question Paper**

**B. Sc. SECOND YEAR SEED TECHNOLOGY**

**Annual Pattern**

**CCBP-II**

**PRACTICAL PAPER-X: BASED ON THEORY PAPER-VI & VIII**

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

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Note: - (i) Attempt all questions

(ii) Show your preparation to the examiner

(iii) Draw neat and well labeled diagrams wherever necessary

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Q1. (10 marks)

Q2. (10 marks)

Q3. (08 marks)

Q4. (08 marks)

Q5. Viva-voce (04 Marks)

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEED TECHNOLOGY – CURRICULUM**

**B.Sc. General (Semester Pattern)**

**Choice Based Credit System (CBCS) Pattern**

**B. Sc. Second Year**

**Annual Pattern**

**CCBP-III**

**PRACTICAL PAPER-XI: BASED ON THEORY PAPERS-VII & IX**

**Maximum Marks: 50**

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**Practical Exercises:**

1. Emasculation and hybridization techniques in different crop species : Rice, Maize.
2. Emasculation and hybridization techniques in Sorghum and Pearl Millet
3. Emasculation and hybridization techniques in Ragi and Pigeonpean.
4. Emasculation and hybridization techniques in Urdbean and Mungbean, Soybean
5. Emasculation and hybridization techniques in Groundnut, Seasame and Sunflower.
6. Emasculation and hybridization techniques in Caster, Cotton
7. Emasculation and hybridization techniques in Cowpea and Tobacco
8. Maintenance breeding of different Kharif crops
9. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods.
10. Study of field techniques for seed production and hybrid seeds production in Kharif crops.
11. Estimation of heterosis, inbreeding depression and heritability.
12. Layout of field experiments.
13. Study of quality characters, donor parents for different characters.
14. Emasculation and hybridization techniques in wheat, oat and barley.
15. Emasculation and hybridization techniques in chickpea and lentil.
16. Emasculation and hybridization techniques in field pea, rapeseed and mustard.
17. Emasculation and hybridization techniques in sunflower.
18. Emasculation and hybridization techniques in potato and berseem.
19. Emasculation and hybridization techniques in sugarcane and cowpea.

20. Emasculation and hybridization techniques in safflower.
21. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods.
22. Study of field techniques for seed production and hybrid seeds production in Rabi crops.
23. Estimation of heterosis, inbreeding depression and heritability.
24. Layout of field experiments.
25. Visit to seed production plots

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEED TECHNOLOGY – CURRICULUM**

**B.Sc. General (CBCS Pattern)**

**Skeleton Question Paper**

**B. Sc. Second Year**

**Annual Pattern**

**CCBP-III**

**PRACTICAL PAPER-XI: BASED ON THEORY PAPER-VII & IX**

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

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Note: - (i) Attempt all questions

(ii) Show your preparation to the examiner

(iii) Draw neat and well labeled diagrams wherever necessary

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Q1. Perform any one experiment (From practical exercise 1 to 6) (12 Marks)

Q2.Perform any one experiment (From practical exercise 7 to 11) (10 Marks)

Q3. Describe procedure and working of any one experiment (From practical exercise 12 to 15) (06 Marks)

Q4. (08 Marks)

Q5. Viva –Voce (04 Marks)

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEED TECHNOLOGY – CURRICULUM**

**B.Sc. General (Semester Pattern)**

**Choice Based Credit System (CBCS)**

**Skeleton Question Paper**

**B. Sc. Second Year**

**Theory Paper**

**Time: 1 hour 30 min.** **Maximum Marks: 40**

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**Note: -** (I) Attempt all questions

(ii) Illustrate your answer with suitable labelled diagrams, wherever necessary

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Q1. Single long answer Type question 15 marks

OR

Two sub questions (a and b of 8 & 7 Marks) 15 marks

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

Q2. Single long answer Type question 15 marks

OR

Two sub questions (a and b of 8 & 7 Marks) 15 marks

(This question will be based on remaining two units with equal weightage to each unit excluding units used in question no 1)

Q3. Attempt any two of the four (Each of 05 Marks) 10 marks

a)

b)

c)

(Note: This question shall be on entire syllabus and must have one sub-question from each of the units)

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEMESTER PATTERN CURRICULUM UNDER**

**CHOICE BASED CREDIT SYSTEM (CBCS) FOR**

**SUBJECT: SEED TECHNOLOGY**

**B.Sc. Second Year**

**Annual Pattern**

**SECB-I (A) SEED PROCESSING TECHNOLOGY**

**Periods: 45** **Credits: 02 (Marks-50)**

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**UNIT I**

Introduction: Principles of seed processing, Methods of seed drying including dehumidification and its impact on seed quality, Relative humidity and equilibrium moisture content of seed; Thumb rules of seed storage, Loss of viability in important agricultural and horticultural crops, Viability equations and application of nomograph, Principles of seed cleaning and methods of seed cleaning, Seed cleaning equipment and their functions, Preparing seed for processing; functions of scalper debearder, scarifier, huller, seed cleaner and grader, Screen cleaners, specific gravity separator, indented cylinder, velvet-spiral-disc separators, colour sorter, delinting machines, Seed blending. Assembly line of processing and storage, receiving, elevating and conveying equipments.

**UNIT II**

Plant design and layout, requirements and economic feasibility of seed processing plant, Seed treatments - methods of seed treatment, seed treating formulations and equipments, seed disinfestations, identification of treated seeds, Packaging: principles, practices and materials; bagging and labeling, Seed storage: Seed drying and storage; drying methods-importance and factors affecting it, Changes during storage, concepts and significance of moisture equilibrium, methods of maintaining safe seed moisture content, Methods to minimize the loss of seed vigour and viability; factors influencing storage losses, Storage methods and godown sanitation. Storage structures, Storage problems of recalcitrant seeds and their conservation.

**Practicals :**

1. Operation and handling of mechanical drying equipment.
2. Effect of drying temperature and duration on seed germination and storability with particular reference to oil seeds.
3. Seed extraction methods.
4. Seed processing equipment.
5. Seed treating equipment.
6. Visit to seed processing plant and commercial controlled and uncontrolled Seed Stores.

7. Seed quality upgradation, Seed blending, Bag closures.

8. Measurement of processing efficiency.

9. Study of orthodox, intermediary and recalcitrant seeds.

10. Evaluating seed viability at different RH and temperature levels and packaging.

11. Prediction of storability by accelerated ageing controlled deterioration tests.

**Note:** Minimum of 5 practicals need to be conducted.

**Reference Books:**


1. Agrawal RL. 1996. Seed Technology. Oxford Publ.
2. Barton LV. 1985. Seed Preservation and Longevity. International Books and Periodicals Supply Service, New Delhi.
3. Hall CW. 1966. Drying of Farms Crops. Lyall Book Depot.
4. Justice OL & Bass LN. 1978. Principles and Practices of Seed Storage Castle House Publ.
5. Mathews RK, Welch GB, Delouche JC & Dougherty GM. 1969. Drying, Processing and Storage of Corn seed in Tropical and Subtropical Regions. Proc. Am. Agric. Eng. St. Joseph, Mich. Paper No. 69-67.
6. Sahay KM & Singh K K. 1991. Unit Operations in Food Engineering. Visas Publ. 7.Virdi SS & Gregg BG. 1970. Principles of Seed Processing. National Seed Corp., New Delhi.

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**CHOICE BASED CREDIT SYSTEM (CBCS) FOR**

**SUBJECT: SEED TECHNOLOGY**

**B.Sc. Second**

**Year Annual**

**Pattern**

**SECB-I (B) SEED QUALITY TESTING**

**Periods: 45** **Credits: 02 (Marks-50)**

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**UNIT I**

Introduction: Structure of monocot and dicot seeds, Seed quality: objectives, concept and components and their role in seed quality control, Instruments, devices and tools used in seed testing, ISTA and its role in seed testing, Seed Sampling: definition, objectives, seed-lot and its size; types of samples; sampling devices; procedure of seed sampling; sampling intensity, Methods of preparing composite and submitted samples; sub-sampling techniques, Dispatch, receipt and registration of submitted sample in the laboratory, sampling in the seed testing laboratory, Physical Purity: definition, objective and procedure, weight of working samples for physical purity analysis; components of purity analysis and their definitions and Criteria, Pure seed definitions applicable to specific genera and families; multiple seed units; general procedure of purity analysis; calculation and reporting of results, Prescribed seed purity standards; determination of huskless seeds; determination of weed seed and other seed by number per kilogram.

**UNIT II**

Determination of other distinguishable varieties (ODV); determination of test weight and application of heterogeneity test, Seed moisture content: importance of moisture content; equilibrium moisture content; principles and methods of moisture estimation- types, instruments and devices used. Pre-drying and grinding requirements, procedural steps in moisture estimation; calculation and reporting of results, Germination: importance; definitions; requirements for germination, instrument and substrata required, Principle and methods of seed germination testing; working sample and choice of method; general procedure for each type of method, Duration of test; seedling evaluation; calculation and reporting of results.

**Practicals:**

1. Structure of monocot and dicot seeds of important plant species.
2. Identification and handling of instruments used in seed testing laboratory.
3. Identification of seeds of weeds and crops; physical purity analysis of samples of different crops.
4. Estimation of seed moisture content (oven method).
5. Seed dormancy breaking methods. Requirements for conducting germination test, specifications and proper use ofdifferent substrata for germination; seed germination testing in different agri-horticultural crops; seedling evaluation.
6. Viability testing by tetrazolium test in different crops
7. Seed and seedling vigour tests applicable in various crops species.

8. Cultivar identification; genetic purity testing by chemical and biochemical.
9. Cultivar identification; genetic purity testing by molecular methods.
10. Seed health testing for designated diseases, blotter methods, agar method and embryo count methods.
11. Testing coated/pelleted seeds.

**Note:** Minimum of 5 practicals need to be conducted.

**Reference Books:**


1. Agarwal RL. 1997. Seed Technology. Oxford & IBH.
2. Agrawal PK & Dadlani M.1992. Techniques in Seed Science and Technology. 2 Ed. South Asian Publ.
3. Agrawal PK. (Ed.). 1993. Handbook of Seed Testing. Ministry of Agriculture, GOI, New Delhi.
4. Copland LO & McDonald MB. 1996 .Principles of Seed Science and Technology. Kluwer.
5. ISTA 2006. Seed Testing Manual. ISTA, Switzerland.
6. Martin C & Barkley D. 1961. Seed Identification Manual. Oxford & IBH.
7. Tunwar NS & Singh SV. 1988. Indian Minimum Seed Certification Standards Central Seed Certification Board, Ministry of Agriculture, New Delhi.

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**SEMESTER PATTERN CURRICULUM UNDER**

**CHOICE BASED CREDIT SYSTEM (CBCS) FOR**

**SUBJECT: SEED TECHNOLOGY**

**B.Sc. Second Year**

**Annual Pattern**

**SECB-II (A) EMERGING TRENDS IN SEED QUALITY ENHANCEMENT**

**Periods: 45** **Credits: 02 (Marks-50)**

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**UNIT I**

Concept and significance of seed quality enhancement; Physical, chemical and pesticidal seed treatments, history, principles and methods of seed treatment, methodology, Factors affecting seed enhancement treatments. Seed priming: physiological and biochemical basis, Types of priming technology, biochemical and molecular changes associated, pre-germination.

**UNIT II**

Film coating and pelleting, seed tapes, seed mats, seed colouring, biopriming. Film coating and pelleting, seed tapes, seed mats, seed colouring, biopriming. Synthetic seeds – Aim and scope for synthetic seeds, historical development, Somatic embryogenesis, somaclonal variation and their control, Embryo encapsulation systems, hardening of artificial seeds, Cryo-preservation, storage of artificial seeds, desiccation tolerance, use of botanicals in improving seed quality etc.

**Practicals:**

1. Seed treatments – methods and techniques, equipments required for seed treatment.
2. Demonstration of film coating of seed.
3. Demonstration of seed invigoration/priming - hydration and dehydration.
4. Demonstration of PEG priming, solid matrix priming.
5. Demonstration of solid matrix priming.
6. Demonstration of bio priming and its effects of priming.
7. Demonstration of methods for hydrogel encapsulation of artificial endosperm,
8. Demonstration of methods hydrophobic coating of seed.
9. Study of protocols for production of synthetic seeds.
10. Visit to leading Seed Companies to study the seed treatment processes.

**Note:** Minimum of five practicals need to be conducted

**References:**


1. Basra AS. (Ed.). 1995. Seed Quality: Basic Mechanisms and Agricultural Implications . Food Product Press, NY.
2. Basra AS. 2006. Handbook of Seed Science and Technology. Food Product. Press, NY
3. Bench ALR & Sanchez RA. 2004. Handbook of Seed Physiology. Food Product Press, NY/ London.
4. Copland LO & McDonald MB. 2004. Seed Science and Technology. Kluwer Acad.
5. Perspective. Associated Publishing Company, New Delhi.
6. Kalloo G, Jain SK, Vari AK & Srivastava U. 2006. Seed: A Global
7. Sandhu, M.K. (1989). Plant Propagation. Madras, Bangalore: Wile Eastern Ltd.

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**CHOICE BASED CREDIT SYSTEM (CBCS) FOR**

**SUBJECT: SEED TECHNOLOGY**

**B.Sc. Second Year**

**Annual Pattern**

**SECB-II (B) SEED HEALTH MANAGEMENT**

**Periods: 45** **Credits: 02 (Marks – 50)**

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**UNIT 1**

Seed Pathology – Introduction, terminology and history, Economic significant of seed borne diseases, Plant quarantine and SPS under WTO, Morphology and anatomy of typical monocotyledonous and dicotyledonous infected seeds, Types of microorganisms associated with seeds and diseases caused by them, Locations of seed borne inoculums and Mechanisms seed infection. Factors affecting the seed infection, Longevity of seed borne pathogens, Factors affecting the Longevity of seed borne pathogens, Mechanisms of seed transmission. Factors affecting the seed transmission, Epidemiological factors influencing the transmission of seed borne diseases, Forecasting of epidemics through seed borne infection.

**UNIT II**

Seed certification and tolerance limit, Types of losses caused by seed borne diseases in true and vegetatively propagated seeds, Evolutionary adaptations of crop plants to defined seed invasion by seed borne pathogens, Deterioration of seeds by storage fungi, production of toxic metabolites affecting seed quality and its impact on human, animal and plant health. Management of seed borne Pathogens/diseases and procedure for healthy seed production, Seed health testing methods for detecting microorganisms.

**Practicals:**

1. **Study of commonly occurring seed - borne fungi.**

   *(Alternaria, Curvularia, Drechslera, Fusarium, Collectotrichum, Phoma, Macrophomina, Aspergillus, Rhizopus, Penicillium etc.)*

2. **Methods of examination of seed borne fungi.**

   A) Visual and microscopic examination of dry seed, B) Seed washing test.

**3. Incubation methods.**

a) Detection of seed borne fungi by blotter method
b) Detection of seed borne fungi by agar plate method
c) Detection of seed borne fungi by freezing method
d) Detection of seed borne fungi by 2-4 D method
e) Detection of internal seed borne fungi by component plating method.

4**. Detection of embryo borne (*Ustilago nuda tritici*) loose smut of Wheat by Embryocount method.**

5. **Study or seedling symptom test**

a) Test tube plain agar method, b) Hiltner's bricks stone method, c) Sand method d)Standard soil method.

6**. Detection of seed borne bacteria**

a) Water agar plate method. b) Quartze sand method.

7. **Detection of seed borne viruses**

a) Examination of dry seed sample Growing on test.

8**. Detection of externally and internally seed borne pathogens by nucleic acidbased techniques**

a) RFLP, PCR, Serological techniques like ELISA

**Note:** Minimum of five practicals need to be conducted

**References:**


1. Agarwal. V.K & J.B Sinclair. 1993. Principles of Seed Pathology. Vols. I & II, CBS Publ., New Delhi.
2. Hutchins J.D & Reeves J.E. (Eds.). 1997. Seed Health Testing: Progress Towards the 21st Century. CABI, Wallington.
3. Paul Neergaard. 1988. Seed Pathology. MacMillan, London
4. Suryanarayana D. 1978. Seed Pathology. Vikash Publ., New Delhi.


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**B.Sc. Second Year**

**Annual Pattern**

**SECB-I &II**

**END OF SEMESTER EXAMINATION (ESE)**

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**SEAT NO:**

**MARK SHEET**

| Sr. No. | END OF SEMESTER EXAMINATION (ESE) | Maximum Marks | Obtained Marks |
|---|---|---|---|
| 1 | Skill Work report submission | 10 | |
| 2 | Over all skill judgment | 10 | |
| 3 | Skill Work presentation | 05 | |
| Total | | 25 | |

**Name & Signature of:**

**Examiner- 1:**

**Examiner- 2:**

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Agrawal PK & Dadlani M.1992. Techniques in Seed Science and Technology. 2 Ed. South Asian Publ.

Agrawal PK. (Ed.). 1993. Handbook of Seed Testing . Ministry of Agriculture, GOI, New Delhi.

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Basra AS. 2006. Handbook of Seed Science and Technology . Food Product. Press, NY

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Bench ALR & Sanchez RA. 2004. Handbook of Seed Physiology. Food Product Press, NY/London.

Bhatia S. C., 1984, Biochemistry in Agricultural Sciences, Shree Publication House, New Delhi.

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David L. Nelson and Michael M. Cox.2012. Lehninger Principles of Biochemisry, 6th Ed . Macmillan Learning, NY, USA

Donald Voet and Judith G. Voet. 2011. Biochemisry, 4th Ed. John Wiley and Sons, Inc., NY, USA.

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ISTA 2006. Seed Testing Manual . ISTA, Switzerland.

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Jayaram. T. 1981. Laboratory manual in biochemistry, Wiley Estern Ltd. New Delhi:

Jeremy M. Berg, John L. Tymoczko, LubertStryer and Gregory J. Gatto, 2002. Biochemisry, 7th Ed. W.H. Freeman and Company, NY, USA

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Mathews RK, Welch GB, Delouche JC & Dougherty GM. 1969. Drying, Processing and Storage of Corn seed in Tropical and Subtropical Regions. Proc. Am. Agric. Eng. St. Joseph, Mich. Paper No. 69-67.

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Phundansingh., Elements of Genetics., Kalyani Publication, New Delhi.

Plummer D. 1988. An Introduction to Practical Biochemistry. 3rd ed. Tata McGraw Hill, New Delhi.

Purohit S.S. 2009, Biochemistry - Fundamentals and Applications, Agrobios, Jodhpur

*Rama RaoA. V. S. S.*, 2002 A *Textbook of Biochemistry*. Edition, 9, illustrated. Publisher, Sangam Books Limited, New Delhi.

*Rastogi S. C.*, 2003 - *Biochemistry* Tata McGraw-Hill Education, New Delhi

*Sadasivam* S, *Manickam* A (1996) *Biochemical methods*. 2nd edition, New Age International (p) Ltd. Publisher, New Delhi..

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