परिपत्रक-UG (1) ST

॥ 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

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, या विद्यापीठा अंतर्गत येणा–या सर्व संलग्नित महाविद्यालयामध्ये शैक्षणिक वर्ष २०२४–२५ पासून पदवीस्तरावर राष्ट्रीय शैक्षणिक धोरण –२०२० लागू करण्याच्या दृष्टीकोनातून विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत येणा–या अभ्यासमंडळांनी तयार केलेल्या पदवी प्रथम वर्षाचे अभ्यासक्रमांना मा. विद्यापरिषदेने दिनांक १५ मे २०२४ रोजी संपन्न झालेल्या बैठकीतील विषय क्रमांक १५/५९–२०२४ च्या ठरावाअन्वये मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील खालील बी. एस्सी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) लागू करण्यात येत आहेत.

1) B. Sc. I year - Botany
2) B. Sc. I year - Seed Technology
3) B. Sc. I year - Horticulture
4) B. Sc. I year - Geology
5) B. Sc. I year - Dairy Science
6) B. Sc. I year -Electronics
7) B. Sc. I year - Environmental Science
8) B. Sc. I year - Fishery Science
9) B. Sc. I year - Mathematics
10) B. Sc. I year - Microbiology
11) B. Sc. I year - Agricultural Microbiology
12) B. Sc. I year - Physics
13) B. Sc. I year - Food Science
14) B. Sc. I year – Computer Science (N M D College Hingoli)

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

डॉ. सरिता लोसरवार
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२४–२५/९१२
दिनांक १२.०६.२०२४

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) मा. संचालक, सर्व संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
५) मा. प्राचार्य, न्यू मॉडल डिग्री कॉलेज हिंगोली.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY,
NANDED - 431 606 (MS)

(Credit Framework and Structure of Four Year UG Program with Multiple Entry and Exit Option as per NEP-2020)

UNDERGRADUATE PROGRAMME OF

SCIENCE & TECHNOLOGY

Major in **SEED TECHNOLOGY** and Minor in **BOTANY**
(Subject)

Under the Faculty of Science & Technology

(Revised as per the Govt. Of Maharashtra circular dt. 13th March 2024)

From the Desk of the Dean, Faculty of Science and Technology

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement "***Enlightened Student: A Source of Immense Power***", is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the University to achieve ***the 3Es, the equity, the efficiency*** and ***the excellence*** in higher education of this region. To overcome the difficulty of comparing the performances of the graduating students and also to provide mobility to them to join other institutions the University has adopted the cumulative grade point average (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better employability, entrepreneurship possibilities and to enhance the latent skills of the stakeholders the University has adopted the Choice Based Credit System (CBCS) in the year 2018-2019 at graduate and post-graduate level. This provided flexibility to the students to choose courses of their own interests. To encourage the students to opt the world-class courses offered on the online platforms like, NPTEL, SWAYM, and other MOOCS platforms the University has implemented the credit transfer policy approved by its Academic Council and also has made a provision of reimbursing registration fees of the successful students completing such courses.

SRTM University has been producing a good number of high calibre graduates; however, it is necessary to ensure that our aspiring students are able to pursue the right education. Like the engineering students, the youngsters pursuing science education need to be equipped and trained as per the requirements of the R&D institutes and industries. This would become possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Higher education is a dynamic process and in the present era the stakeholders need to be educated and trained in view of the self-employment and self-sustaining skills like start-ups. Revision of the curriculum alone is not the measure for bringing reforms in the higher education, but invite several other initiatives. Establishing industry-institute linkages and initiating internship, on job training for the graduates in reputed industries are some of the important steps that the University would like to take in the coming time. As a result, revision of the curriculum was the need of the hour and such an opportunity was provided by the New Education Policy 2020. National Education Policy 2020 (NEP 2020) aims at equipping students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. As a result the

students will acquire expertise in specialized areas of interest, kindle their intellectual curiosity and scientific temper, and create imaginative individuals.

The curriculum given in this document has been developed following the guidelines of NEP-2020 and is crucial as well as challenging due to the reason that it is a transition from general science based to the discipline-specific-based curriculum. All the recommendations of the ***SukanuSamiti*** given in the **NEP Curriculum Framework-2023** have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. All the Board of Studies (BoS) under the Faculty of Science and Technology of this university have put in their tremendous efforts in making this curriculum of international standard. They have taken care of maintaining logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding of the students. We take this opportunity to congratulate the Chairman(s) and all the members of various Boards of Studies for their immense contributions in preparing the revised curriculum for the benefits of the stakeholders in line with the guidelines of the **Government of Maharashtra regarding NEP-2020**. We also acknowledge the suggestions and contributions of the academic and industry experts of various disciplines.

We are sure that the adoption of the revised curriculum will be advantageous for the students to enhance their skills and employability. Introduction of the mandatory ***On Job Training, Internship program*** for science background students is praise worthy and certainly help the students to imbibe firsthand work experience, team work management. These initiatives will also help the students to inculcate the workmanship spirit and explore the possibilities of setting up of their own enterprises.

Dr. M. K. Patil
Dean
Faculty of Science and Technology

From Desk of Chairman, Board of Studies of the Subject Botany

PREAMBLE

The B.Sc. Seed Technology semester pattern course is running in affiliated college of the S.R.T.M.U. Nanded. The program is designed to encourage and support the growing demands and challenging trends in the academic environment. Our training focuses on holistic development of students to face the competitive world. The course content has been designed on NEP-2020 pattern. The program consists of Major (C), Minor (M), Generic Electives (GE), Vocational and Skill Enhancement Course (VSEC). The course content of each theory paper is divided into four 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.

The programme also inculcates various attributes at the Honours level. These attributes encompass values related to emotional stability, social justice, creative and critical thinking, well-being and various skills required for employability, thus preparing students for continuous learning and sustainability. The new curriculum based on learning outcomes of BSc (Honours) Seed Technology offers knowledge of areas including Plant Physiology, Plant Biotechnology, Genetics and Plant Breeding, Seed Pathology, Seed Biology, etc. The courses define clearly the objectives and the learning outcomes, enabling students to choose the elective subjects broadening their skills in the field of Seed Technology. The course also offers skills to pursue research and teaching in the field of Seed Technology and thus would produce best minds to meet the demands of society This curriculum framework for the bachelor-level program in Seed Technology is developed keeping in view of the student-centric learning pedagogy, which is entirely outcome-oriented and curiosity-driven. To avoid a rote-learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on the pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works. In addition of Generic Electives, Vocational and Skill Enhancement Courses aims to develop skills in plant sciences and practical experience in the students.

OBJECTIVES OF THE B. Sc. SEED TECHNOLOGYPROGRAMME:

The Objective of this program are :

1. To promote the possibility of self-employment after BSc / MSc Seed Technology.
2. Bridge up the gap between knowledge based conventional education and market demands and to provide an alternative to those pursuing higher education.
3. To enrich students' training and knowledge that would be useful in the seed industry.
4. To introduce the concepts of experimental design in Seed Technology.
5. To inculcate sense of job responsibilities, while maintaining social and environment awareness.
6. To help students build-up a progressive and successful career in industries with a biotechnological perspective.

PROGRAM SPECIFIC OUTCOMES (PSO) OF B.Sc. SEED TECHNOLOGY:

By the end of the program the students will be able to:

PO1: CBCS syllabus with a combination of general and specialized education shall introduce the concepts of breadth and depth in learning.

PO2: Shall produce competent seed technologists who can employ and implement their acquired knowledge in fundamental and applied aspects that will profoundly influence prevailing paradigms of agriculture, industry and environment to provide sustainable development.

PO3: Will increase the ability of critical thinking, development of scientific attitude, handling of problems and generating solution, improve practical skills, enhance communication skill, social interaction, increase awareness in judicious use of plant resources by recognizing the ethical value system.

PO4: The training provided to the students will make them competent enough for doing jobs in Govt. and private sectors of academia, research and industry along with graduate preparation for national as well as international competitive examinations, especially UGC-CSIR NET, UPSC Civil Services Examination, IFS, NSC, FCI, FRI etc.

PO5: Certificate and diploma courses are framed to generate self- entrepreneurship and self-employability, if multi exit option is opted.

PO6: Lifelong learning can be achieved by tapping into the vast world of knowledge of plant breeding and propagation.

Dr. Saheb Laxmanrao Shinde

Chairman,

Board of Studies in Botany

Swami Ramanand Teerth Marathwada University,

Nanded

Details of the Board of Studies Members in the subject Botany under the faculty of Science & Technology of S.R.T.M. University, Nanded

Sr No	Name of the Member	Designation	Address	Contact No.
1.	**Dr.SahebLaxmanraoShinde**	Chairman	YeshwantMahavidylaya, Nanded	7588151967
2	**Dr.BabasahebShivmurtiSurwase**	Member	School of Life Sciences, S.R.T.M.U. Nanded	9075829767
3	**Dr. B. D. Gachande**	Member	Science College, Nanded	8788727840
4	**Dr Vijay TulshiramGorgile**	Member	ShahirAnnabhauSatheMahavidyalaya, Mkhed	9421762073
5	**Dr.Sudhakar V. Chate**	Member	Shivaji College, Udgir	8421241300
6	**Dr. Suresh ManoharraoTelang**	Member	YeshwantMahavidyalaya, Nanded	9822174684
7	**Dr. R. M. Kadam**	Member	M. G. M. Ahmedpur, Tq. Ahmedpur, Dist. Latur.	9422657976
8	**Dr.SopanDnyanobaDhavale**	Member	ShahirAnnabhauSatheMahavidyalaya, Mukhed,	9423614703
9.	**Dr. Sanjay MarotraoDalvi**	Member	Shri Guru BuddhiswamiMahavidyalaya, Purna (Jn),	9921101210
10	**Dr.Prashant A. Gawande**	Professor from other University	SantGadge Baba Amravati University,Amravati.	9403622568
11	**Dr.AmbadasSheshraoKadam**	Experts	DSM College Parbhani.	8329151172
12	**Dr.KanhaiyaRanganathraoKadam**	Experts	K.K. Herbal Industries, Gut No. 252, Naleshwar Road, Limbgaon, Nanded.	9420261080
13	**BinduMaurya**	Experts	07, MangalPravesh building Polt. C-16 Sector-3 Airoli, Navi Mumbai.	9987591561
14	**ShriBhanudasBalajiraoPendkar**	Experts	K-Ferts Lab, W-4, MIDC Industrial Area, Nanded. Invitee Member	8888896710

B. Sc. First Year Semester I *(Level 4.5)*

Teaching Scheme

	Course Code	CourseName	CreditsAssigned			TeachingScheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SSTLCT1101	**Principles of Seed Technology**	02	--	**04**	02	--
	SSTLCP1101	**Practical Based on SSTLCT 1101**	-	02			04
Optional 2	SBOTCT1101	**Optional 2**	02	--	**04**	02	--
	SBOTCP1101	**Optional 2**	-	02			04
Optional 3	SCHECT1101	**Optional 3**	02	--	**04**	02	--
	SCHECP1101	**Optional 3**	-	02			04
Generic Electives *(from other Faculty)*	SSTLGE1101	**Morphology of Seed Plants (Basket 3)**	02	--	**02**	02	--
Skill Based Course (related to Major)	SSTLSC1101	**Seed biology**	--	02	**02**	--	04
Ability Enhancement Course	AECENG1101	L1 – Compulsory English	02	--	**02**	02	--
Ability Enhancement Course	**ACEMIL1101**	**(MAR/HIN/URD /KAN/PAL)**	02	--	**02**	02	--
Indian Knowledge System (IKS)	IKSXXX1101	Select from **Basket 5**	02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. First Year Semester I *(Level 4.5)*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	CourseName (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SSTLCT1101	**Principles of Seed Technology**	10	10	10	40	--	--	50
	SSTLCP1101	**Practical Based on SSTLCT 1101**	--	--	--	--	20	30	50
Optional 2	SBOTCT1101	**Optional 2**	10	10	10	40	--	--	50
	SBOTCP1101	**Optional 2**	--	--	--	--	20	30	50
Optional 3	SCHECT1101	**Optional 3**	10	10	10	40	--	--	50
	SCHECP1101	**Optional 3**	--	--	--	--	20	30	50
Generic Elective	SSTLGE1101	**Morphology of Seed Plants (Basket 3)**	10	10	10	40	--	--	50
Skill Based Course	SSTLSC1101	**Seed biology**	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1101	L1 – Compulsory English	10	10	10	40	--	--	50
Ability Enhancement Course	**ACEMIL1101**	**(MAR/HIN/URD /KAN/PAL)**	10	10	10	40	--	--	50
Indian Knowledge System (IKS)	IKSXXX1101	Select from **Basket 5**	10	10	10	40	--	--	50

B. Sc. First Year Semester II*(Level 4.5)*

Teaching Scheme

	Course Code	CourseName	CreditsAssigned			TeachingScheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SSTLCT1151	**Seed Physiology**	02	--	**04**	02	--
	SSTLCP1151	**Practical Based on SSTLCT 1151**	-	02			04
Optional 2	SBOTCT1151	**Optional 2**	02	--	**04**	02	--
	SBOTCP1151	**Optional 2**	-	02			04
Optional 3	SCHECT1151	**Optional 3**	02	--	**04**	02	--
	SCHECP1151	**Optional 3**	-	02			04
Generic Electives *(from other Faculty)*	SSTLGE1151	**Developmental study of seed plants (Basket 3)**	02	--	**02**	02	--
Skill Based Course (related to Major)	SSTLSC1151	**Techniques in Seed Physiology**	--	02	**02**	--	04
Ability Enhancement Course	AECENG1151	L1 – Compulsory English	02	--	**02**	02	--
Ability Enhancement Course	**ACEMIL1151**	**(MAR/HIN/URD /KAN/PAL)**	02		**02**	02	
Value Education Courses	**VECCOI1151**	**Constitution of India**	02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. First Year Semester II*(Level 4.5)*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	CourseName (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SSTLCT1151	**Seed Physiology**	10	10	10	40	--	--	50
	SSTLCP1151	**Practical Based on SSTLCT 1151**	--	--	--	--	20	30	50
Optional 2	SBOTCT1151	**Optional 2**	10	10	10	40	--	--	50
	SBOTCP1151	**Optional 2**	--	--	--	--	20	30	50
Optional 3	SCHECT1151	**Optional 3**	10	10	10	40	--	--	50
	SCHECP1151	**Optional 3**	--	--	--	--	20	30	50
Generic Elective	SSTLGE1151	**Developmental study of seed plants (Basket 3)**	10	10	10	40	--	--	50
Skill Based Course	SSTLSC1151	**Techniques in Seed Physiology**	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1151	L1 – Compulsory English	10	10	10	40	--	--	50
Ability Enhancement Course	**ACEMIL1151**	**(MAR/HIN/URD /KAN/PAL)**	10	10	10	40	--	--	50
Value Education Courses	**VECCOI1151**	**Constitution of India**	10	10	10	40	--	--	50

Syllabus for B. Sc. Seed Technology, First Year

Semester – I

As Per National Education Policy- 2020

To be Implemented from

Academic Year 2024-2025

National Education Policy 2020

B.Sc. Seed Technology, I Year (Semester - I)

Major Core Theory Course

Course Code – SSTLCT1101

Title of the Course: PRINCIPLES OF SEED TECHNOLOGY

[No. of Credits: 2 Credit] **[Total:30Hours]**

Course pre-requisite:

1. The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ICSC/HSC for entry level core courses in Seed Technology optional subject.
2. The student should have basic knowledge of plant science.

Course objectives:

1. To introduce the basic concept and various aspects of seed technology
2. To impart knowledge about process of development and germination.
3. To provide basic knowledge of differences in internal morphology of different types of seed.

Course outcomes:

4. Student gain basic knowledge regarding structure of different kinds of seeds.
5. Student will get knowledge on seed and fruit development of various crop plants.
6. Student will get knowledge on composition of seed and food reserves accumulation in seed.

CURRICULUMDETAILS:SSTLCT 1101: PRINCIPLES OF SEED TECHNOLOGY

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Concept of Seed Technology**	**07**
	1.1	History, Concept and aim of seed Technology,	
	1.2	Seed Definition. Types, Characteristics of good seed, Seed development programme (a. Basis of seed programme, b Types of seed programme c. National seed programme),	
	1.3	Seed development programme (a. Basis of seed programme, b Types of seed programme c. National seed programme),	
	1.4	Role of agencies in the development of Indian Seed Industry. (National Seed Coorporation (NSC), Tarai Development Coorporation (TDC), State Farm Coorporation (SFC).	
2.0		**Floral morphology & Seed development**	**08**
	2.1	Structure of flowers,	
	2.2	Microsporangium, Microsporogenesis and Development of Male Gametophyte,	
	2.3	Megasporangium, Megasporogenesis and Development of Female Gametophyte,	
	2.4	Pollination, Fertilization and Apomixis, Development of Dicot and Monocot Embryo, Types of Endosperm and Types of Fruit.	
3.0		**Internal Seed Morphology**	**07**
	3.1	Structure difference between dicot & monocot Seed,	
	3.2	Structure of Imp. Seeds – Pea, Gram, Soyabean and Castor,	
	3.3	Chemical composition of seeds,	
	3.4	Seed Dormancy- Types, Causes, Methods of breaking Dormancy, Difference between seed and grain.	
4.0		**Seed Germination & Metabolism**	**08**
	4.1	Seed Germination – Pattern and types	
	4.2	Basic requirements for germination,	
	4.3	Normal and abnormal seedlings, Germination inhibitors,	
	4.4	Metabolism of storage products during seed germination.	
		Total	**30**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi.
2. **Agarwal, R.L**. 1996. **Seed Technology**. Oxford and IBH Publication Co., New Delhi.

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **Thomson, J.R.** 1979. **An Introduction to Seed Technology**. Leonard Hill, London.

National Education Policy 2020

B.Sc. Seed Technology, I Year (Semester - I)

Major Practical Course

Course Code – SSTLCP 1101

Title of the Course: Practical based on SSTLCT 1101

[No. of Credits: 2 Credit] **[Total:60 Hours]**

Course pre-requisite:

1. The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Seed Technology as Major subject.
2. The students should have basic knowledge of plant science.

Course objectives:

1. To introduce the basic concept and various aspects of seed technology.
2. To impart knowledge about process of seed development and germination.
3. To provide basic knowledge of differences in internal morphology of different types of seed.
4. To give basic information on Physiological basis of seed vigour and viability in relation to crop.
5. To provide an insight into physiological processes regarding seed germination, dormancy.

Course outcomes:

1. Student will get knowledge on composition of seed and food reserves accumulation in seed.
2. Student will get knowledge on seed and fruit development of various crop plants.
3. Student gain basic knowledge on physiological process involved in seed development.
4. Students will get knowledge on biochemistry of seed.
5. Studnt should be able to understand the concept, causes and mitigation measures of seed dormancy.

CURRICULUMDETAILS: SSTLCP 1101: Practical based on SSTLCT 1101

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Study of floral morphology	4
2.	To study the Morphology of Dicot Seed	4
3.	To study the Morphology of Monocot Seed	4
4.	Seedling morphology and adult plan morphology in some major crops for identification of a variety.	4
5.	To study the seed viability test: Tz test	4

6.	Study the different seed germination tests.	4
7.	Study of different types of Endosperm	4
8.	Factors affecting germination - Temperature, moisture and light.	4
9.	Estimation of starch from given seed sample.	4
10.	To study the kinetics of seed imbibition and solute leakage.	4
11.	To determine the solute leakage with the help of EC/ pH meter.	4
12.	Estimation of seed moisture content from given seed sample.	4
13.	To demonstrate the different methods of dormancy breaking.	4
14.	To study accelerated ageing and controlled deterioration tests.	4
15.	To study the effect of accelerated ageing on seed viability	4
	Total	**60**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi.
2. **Agarwal, R.L**. 1996. **Seed Technology**. Oxford and IBH Publication Co., New Delhi.
3. **Basra AS**. 2006. **Handbook of Seed Science and Technology** . Food Product Press.
4. **Bench ALR & Sanchez RA.** 2004. **Handbook of Seed Physiology** . Food Product Press.

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **Baskin CC & Baskin JM**. 1998. **Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination** . Academic Press.
3. **Bewley JD & Black M**. 1985. **Seed: Physiology of Seed Development and Germination** . Plenum Press.
4. **Copeland LO &Mc Donald MB**. 1995. **Principles of Seed Science and Technology** . 3 Ed. Chapman & Hall. rd
5. **Kigel J &Galili** G. (Eds.). **Seed Development and Germination** . Marcel Dekker.
6. **Thomson, J.R.** 1979. **An Introduction to Seed Technology**. Leonard Hill, London.

National Education Policy 2020

B.Sc. Seed Technology, I Year (Semester - I)

Generic Elective Course

Course Code – SSTLGE1101

Title of the Course: MORPHOLOGY OF SEED PLANTS

[No. of Credits: 2 Credit] **[Total:30 Hours]**

Course pre-requisite:

1. The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Seed Technology as Major subject.
2. The students should have basic knowledge of plant science.

Course objectives:

1. To impart basic knowledge of morphology of seeds.
2. To impart knowledge about various steps involved in the process of seed development.

Course outcomes:

1. Students should be able to identify seeds identification on the basis of morphological characters.
2. Student should understand the different agencies involved in the process of pollination.
3. Understanding the theoretical orientation of seed development.

CURRICULUMDETAILS: SSTLGE 1101:MORPHOLOGY OF SEED PLANTS

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction to Flower**	**08**
	1.1	Definition of flower and types,	
	1.2	Parts of a Typical Flower	
	1.3	Different accessory and non-accessory whorl of flowers	
	1.4	L. S. of Typical Flower	
2.0		**Microsporangium**	**07**
	2.1	Concept	
	2.2	Structure (T.S of typical anther)	
	2.3	Development of microspore	
	2.4	Development of male gametophyte	

3.0		**Megasporangium**	**07**
	3.1	Concept	
	3.2	Structure (L.S of Ovule) and types of ovules	
	3.3	Development of megaspore	
	3.4	Development of female gametophyte	
4.0		**Study of flowers of respective families**	**08**
	4.1	Malvaceae (*Gossypiumarboreum*/ *Abelmoschusesculentus*)	
	4.2	Fabaceae (*Glycine max*/ *Cajanuscajan*)	
	4.3	Solanaceae (*Solanummelongena*/ *Lycopersicumesculentum*)	
	4.4	Poaceae (*Zea mays* and *Triticumaestivum*)	

Text Books and Reference Books:

Text Books:

1. **Singh BD**. 2005. **Plant Breeding**: **Principles and Methods**. Kalyani Publication.
2. **Singhal NC.** 2003. **Hybrid Seed Production in Field Crops**. Kalyani Publication.

Reference Books:

1. **Chhabra AK**. 2006. **Practical Manual of Floral Biology of Crop Plants**. Dept. of Plant Breeding CCS HAU, Hisar.
2. **Desai BB.** 2004. **Seeds Handbook**. Marcel Dekker. Kelly AF. 1988. Seed Production of Agricultural Crops. Longman.
3. **McDonald MB Jr& Copeland LO**. 1997. **Seed Production: Principles and Practices**. Chapman & Hall.
4. **Poehlman JM &Sleper DA**. 2006. **Breeding Field Crops**. Blackwell.

National Education Policy 2020

B.Sc. Seed Technology, I Year (Semester - I)

Skill Enhancement Course

Course Code – SSTLSC1101

Title of the Course: SEED BIOLOGY

[No. of Credits: 2 Credit] [Total:60 Hours]

Course pre-requisite:

1. The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Seed Technology as Major subject.
2. The students should have basic knowledge of plant science.

Course objectives:

1. To impart knowledge about morphology of different kind of seed.
2. To provide information on different methods of viability testing.
3. To provide knowledge about identification of crop on the basis of seed morphology.

Course outcomes:

1. Student will get knowledge on composition of seed and food reserves accumulation in seed.
2. Student gain basic knowledge regarding structure of different kinds of seeds.
3. Student will get knowledge on seed and fruit development of various crop plants.

CURRICULUMDETAILS: SSTLSC 1101: SEED BIOLOGY

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	To study the different flower parts and their functions.	4
2.	Study the structure of Dicot Seed	4
3.	Study the structure of Monocot Seed	4
4.	Seedling morphology and adult plan morphology in some major crops for identification of a variety.	4
5.	Seed viability test	4
6.	Seed germination test	4
7.	Study of different types of Endosperm	4
8.	Study of chemical composition of seeds for example carbohydrates, protein and lipid etc.	4
9.	Factors affecting germination - Temperature, moisture and light.	4
10.	Pattern of water absorption (starch, protein and oil).	4
11.	Hard seedness.	4

12.	Identification of different kind of seeds.	4
13.	Seed and seedling vigour test	4
14.	Seed moisture testing	4
15.	Visit to a seed testing laboratory	4
	Total	**60**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi.
2. **Agarwal, R.L**. 1996. **Seed Technology**. Oxford and IBH Publication Co., New Delhi.
3. **Basra AS**. 2006. **Handbook of Seed Science and Technology** . Food Product Press.
4. **Bench ALR & Sanchez RA.** 2004. **Handbook of Seed Physiology** . Food Product Press.

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **Agrawal PK &Dadlani M.** (Eds.). 1992. **Techniques in Seed Science and Technology**. South Asian Publ.
3. **Baskin CC & Baskin JM**. 1998. **Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination** . Academic Press.
4. **Bewley JD & Black M**. 1985. **Seed: Physiology of Seed Development and Germination** . Plenum Press.
5. **Copeland LO &Mc Donald MB**. 1995. **Principles of Seed Science and Technology** . 3 Ed. Chapman & Hall. rd
6. **Kigel J &Galili** G. (Eds.). **Seed Development and Germination** . Marcel Dekker.
7. **Thomson, J.R.** 1979. **An Introduction to Seed Technology**. Leonard Hill, London.

Syllabus for B. Sc. Seed Technology, First Year

Semester – II

As Per National Education Policy- 2020

To be Implemented from

Academic Year 2024-2025

National Education Policy 2020

B.Sc. Seed Technology, I Year (Semester - II)

Major Core Theory Course

Course Code – SSTLCT 1151

Title of the Course: SEED PHYSIOLOGY

[No. of Credits: 2 Credit] **[Total:30Hours]**

Course pre-requisite:

1. The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Seed Technology as Major subject.
2. The students should have basic knowledge of plant science.

Course objectives:

1. To provide an insight into physiological processes regarding seed germination, dormancy.
2. To give basic information on Physiological basis of seed vigour and viability in relation to crop

Course outcomes:

1. To enjoy the physiological processes involved in seed.
2. To understand the physiological mechanism involved in dormancy and germination.
3. To compare the role of growth regulators in seed germination.
4. Students will get knowledge on growth hormones, flowering hormones, plant science etc.

CURRICULUMDETAILS: SSTLCT 1151: SEED PHYSIOLOGY

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Physiology of seed development**	**07**
	1.1	Physiology of seed development and maturation,	
	1.2	Chemical composition, synthesis & accumulation of seed reserves,	
	1.3	Induction of desiccation tolerance,	
	1.4	Hormonal regulation of seed development.	
2.0		**Seed germination**	**08**
	2.1	Factors affecting seed germination,	
	2.2	Mobilization of stored reserve food during seed germination.	
	2.3	Factors affecting seed dormancy,	
	2.4	Genetic control of dormancy.	
3.0		**Seed viability & seed deterioration**	**08**
	3.1	Seed viability concept,	
	3.2	pre and post-harvest factors affecting seed viability,	
	3.3	Seed ageing ; physiology of seed deterioration ;	
	3.4	lipid peroxidation and other viability theories; means to prolong seed viability,	
4.0		**Seed Vigour**	**07**
	4.1	Concept of seed vigour,	
	4.2	Vigour test methods,	
	4.3	Factors affecting seed vigour,	
	4.4	Physiological basis of seed vigour in relation to crop performance & yield.	
		Total	**30**

Text Books and Reference Books:

Text Books:

1. **Basra AS**. 2006. **Handbook of Seed Science and Technology** . Food Product Press.
2. **Bench ALR & Sanchez RA.** 2004. **Handbook of Seed Physiology** . Food Product Press.

Reference Books:

1. **Agrawal PK &Dadlani M.** (Eds.). 1992. **Techniques in Seed Science and Technology**. South Asian Publ.
2. **Baskin CC & Baskin JM**. 1998. **Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination** . Academic Press.
3. **Bewley JD & Black M**. 1985. **Seed: Physiology of Seed Development and Germination** . Plenum Press.
4. **Copeland LO &Mc Donald MB**. 1995. **Principles of Seed Science and Technology** . 3 Ed. Chapman & Hall. rd
5. **Kigel J &Galili** G. (Eds.). **Seed Development and Germination** . Marcel Dekker.

National Education Policy 2020

B.Sc. Seed Technology, I Year (Semester -II)

Major Practical Course

Course Code – SSTLCP 1151

Title of the Course: Practical based on SSTLCT 1151

[No. of Credits: 2 Credit] **[Total:60 Hours]**

Course pre-requisite:

1. The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Seed Technology as Major subject.
2. The students should have basic knowledge of plant science.

Course objectives:

1. To provide an insight into different methods of testing viability.
2. To give information on different vigour testing methods.
3. To give knowledge about different priming techniques.

Course outcomes:

1. To enjoy the physiological processes involved in seed.
2. To understand the physiological mechanism involved in dormancy and germination
3. To compare the role of growth regulators in seed germination
4. Students will get knowledge on methods of breaking seed dormancy

CURRICULUMDETAILS: SSTLCP 1151: Practical based on SSTLCT 1151

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	To study of proximate analysis of chemical composition of seed	4
2.	T0 study of different methods of testing viability	4
3.	To study the kinetics of seed imbibition and solute leakage	4
4.	To determine the solute leakage with the help of EC/ pH meter	4
5.	To demonstrate the effect of temperature on seed germination	4
6.	To demonstrate the effect of moisture on seed germination	4
7.	To demonstrate the different methods of dormancy breaking	4
8.	To study different seed invigoration treatments.	4
9.	To study the accelerated ageing tests	4
10.	To study the controlled deterioration tests	4

11.	To study the enzymatic activities and determination of respiration during germination	4
12.	To study the effect of accelerated ageing on seed viability	4
13.	To study the different direct vigour testing methods etc.	4
14.	To study the different indirect vigour testing methods etc.	4
15.	To study different priming treatments	4
	Total	**60**

Text Books and Reference Books:

Text Books:

3. **Basra AS**. 2006. **Handbook of Seed Science and Technology** . Food Product Press.
4. **Bench ALR & Sanchez RA.** 2004. **Handbook of Seed Physiology** . Food Product Press.

Reference Books:

6. **Agrawal PK &Dadlani M.** (Eds.). 1992. **Techniques in Seed Science and Technology**. South Asian Publ.
7. **Baskin CC & Baskin JM**. 1998. **Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination** . Academic Press.
8. **Bewley JD & Black M**. 1985. **Seed: Physiology of Seed Development and Germination** . Plenum Press.
9. **Copeland LO &Mc Donald MB**. 1995. **Principles of Seed Science and Technology** . 3 Ed. Chapman & Hall. rd
10. **Kigel J &Galili** G. (Eds.). **Seed Development and Germination** . Marcel Dekker.

National Education Policy 2020

B.Sc. Seed Technology, I Year (Semester - II)

Generic Elective Course

Course Code – SSTLGE 1151

Title of the Course: DEVELOPMENTAL STUDY OF SEED PLANTS

[No. of Credits: 2 Credit] [Total:30 Hours]

Course pre-requisite:

1. The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Seed Technology as Major subject.
2. The students should have basic knowledge of plant science.

Course objectives:

1. To provide the knowledge regarding the process of embryo and endosperm development in seed.
2. To impart the knowledge about process of conversion of seed into fruit.

Course outcomes:

1. Student will get knowledge on pollination behavior and food reserves accumulation pattern of crop plant.
2. Student should get knowledge of reproduction in plant, seed structure and development.
3. Learn about the different kinds of seeds and fruits.

CURRICULUMDETAILS: SSTLGE 1151: DEVELOPMENTALSTUDY OF SEED PLANTS

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Reproduction**	**08**
	1.1	Definition and Concept	
	1.2	Vegetative propagation (Natural-Tuber, Bulb and Sucker; Artificial-Cutting, Budding, Layering and Grafting)	
	1.3	Sexual Reproduction	
	1.4	Apomixis	
2.0		**Pollination and Fertilization**	**07**
	2.1	Definition and Concept, Types of pollination (Autogamy and Allogamy), agencies involved,	
	2.2	Self and cross pollinated crop species	

	2.3	Advantages and Disadvantages of both self and cross pollination Definition	
	2.4	Process of fertilization in angiosperm	
3.0		**Endosperm and Embryo Development of seed**	**08**
	3.1	Definition and concept, Types of endosperm and embryo	
	3.2	Definition of seed Difference between Seed and Grain	
	3.3	Concept of Seed Quality (Genetic purity, physical purity, germination percentage, seed moisture, seed health)	
	3.4	Types (based on life span) of seed (Recalcitrant and Orthodox)	
4.0		**Study of Fruit types**	**07**
	4.1	Achene- Strawberry, Cypsella- Sunflower	
	4.2	Caryopsis- Maize, Legume-Tur	
	4.3	Capsule- Okra, Berry- Tomato	
	4.4	Pepo- Cucumber, Cremocarp- Coriander	
		Total	**30**

Text Books and Reference Books:

Text Books:

1. **Singh B. D.** 2018. **Plant Breeding Principles and Methodology**, Kalyani Publishers, New Delhi.
2. **Singhal NC.** 2003. **Hybrid Seed Production in Field Crops**. Kalyani Publication.

Reference Books:

1. **Chhabra AK**. 2006. **Practical Manual of Floral Biology of Crop Plants**. Dept. of Plant Breeding CCS HAU, Hisar.
2. **Desai BB.** 2004. **Seeds Handbook**. Marcel Dekker. Kelly AF. 1988. Seed Production of Agricultural Crops. Longman.
3. **McDonald MB Jr& Copeland LO**. 1997. **Seed Production: Principles and Practices**. Chapman & Hall.
4. **Singh BD**. 2005. **Plant Breeding: Principles and Methods**. Kalyani.
5. **Thompson JR**. 1979. **An Introduction to Seed Technology**. Leonard Hill.

National Education Policy 2020

B.Sc. Seed Technology, I Year (Semester - II)

Skill Enhancement Course

Course Code – SSTLSC 1151

Title of the Course: TECHNIQUES IN SEED PHYSIOLOGY

[No. of Credits: 2 Credit] **[Total:30 Hours]**

Course pre-requisite:

1. The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Seed Technology as Major subject.
2. The students should have basic knowledge of plant science.

Course objectives:

1. To provide an insight into different methods of testing viability.
2. To give information on different vigour testing methods.
3. To give knowledge about different priming techniques.

Course outcomes:

1. To enjoy the physiological processes involved in seed.
2. To understand the physiological mechanism involved in dormancy and germination
3. To compare the role of growth regulators in seed germination
4. Students will get knowledge on methods of breaking seed dormancy

CURRICULUMDETAILS:SSTLSC 1151:TECHNIQUES IN SEED PHYSIOLOGY

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	To study of different types of seed germination tests.	4
2.	To study quick viability test (TZ).	4
3.	To identify types of dormancy and methods of breaking dormancy.	4
4.	To study seed pelleting methods.	4
5.	To study synthetic seed technology	4
6.	To demonstrate the effect of moisture and temperature on seed germination	4
7.	To Evaluate the effects of different storage conditions (temperature and humidity) on seed longevity and vigour.	4
8.	To study different seed priming techniques to enhance germination and early seedling growth.	4
9.	To study the seedling vigour test using vigour indices.	4

10.	To study the effect of plant growth regulators on seedling development.	4
11.	To study the proximate analysis of chemical composition of seed.	4
12.	To study the kinetics of seed imbibitions and solute leakage.	4
13.	To study the different seed invigoration treatments.	4
14.	To study the different seed quality enhancement techniques.	4
15.	To visit seed testing laboratories.	4
	Total	**60**

Text Books and Reference Books:

Text Books:

5. **Basra AS**. 2006. **Handbook of Seed Science and Technology** . Food Product Press.
6. **Bench ALR & Sanchez RA.** 2004. **Handbook of Seed Physiology** . Food Product Press.

Reference Books:

11. **Agrawal PK &Dadlani M.** (Eds.). 1992. **Techniques in Seed Science and Technology**. South Asian Publ.
12. **Baskin CC & Baskin JM**. 1998. **Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination** . Academic Press.
13. **Bewley JD & Black M**. 1985. **Seed: Physiology of Seed Development and Germination** . Plenum Press.
14. **Copeland LO &Mc Donald MB**. 1995. **Principles of Seed Science and Technology** . 3 Ed. Chapman & Hall. rd
15. **Kigel J &Galili** G. (Eds.). **Seed Development and Germination** . Marcel Dekker.

Guidelines for the Course Assessment:

A. Continuous Assessment (CA) (20% of the Maximum Marks) of theory and practical courses:

i. **For Theory Course:** CA shall form 20% of the Maximum Marks and shall be carried out over the entire semester. It shall be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (on remaining 40% syllabus) and average of the marks scored by a student in these two tests of a particular paper shall be taken as the **CA** score.

ii. **For Practical Course:** CA score of the practical course shall be marks scored by a student in the internal practical examination conducted by the concerned teacher.

B. End Semester Assessment (80% of the Maximum Marks) of theory and practical courses:

(For illustration a paper of 02 credits, 50 marks has been considered and shall be modified appropriately depending upon credits of the individual paper)

Question Paper Pattern of the ESA:

i. **ESA Question paper shall consist 6 questions, each of 10 marks**
ii. **Question No.1 shall be compulsory and shall be based on the entire syllabus**
iii. Students shall have to solve ***ANY THREE***of the remaining Five Questions (i.e. from question 2 to 6)
iv. **Students shall have to solve a TOTAL of 4 Questions.**

C. Assessment of On Job Training (OJT) Course (for 04 credits):

a. Continuous assessment part (**40%, 40 marks out of 100**) of this course shall be done by the mentor of the student, where he /she is supposed to complete his On Job Training. This shall be based on the regularity, participation and performance of the students at the place of OJT.

b. Semester End Assessment (ESA) (**60% of the total marks, 60 marks out of 100**) of this course shall be done by a panel of examiners in two parts

i. based on the work report submitted by the student (**50%i.e. 30 marks)** and

ii. **Remaining 50%**(30 marks) shall be based on his presentation and viva-voce on the work carried to be assessed by the panel of examiners. This assessment shall be done along with practical examinations of respective courses / subjects.

D. Assessment of Field Project (FP) and Research Project (RP) (e.g. for 02 credits)

a. Continuous assessment part (**40%, 20 marks out of 50**) of this course shall be done by the mentor of the student and shall be based on regularity, experimental work and performance of the student.

b. Semester End Assessment (ESA) (**60% of the total marks, 30 marks out of 50**) of this course shall be done shall be done by a panel of examiners in two parts

i. based on the work report submitted by the student (**50% i.e. 30 marks)** and

ii. **Remaining 50%** (30 marks) shall be based on his presentation and viva-voce on the work carried out by the student. This assessment shall be done along with practical examinations of therespective courses / subjects.

E. Assessment of Co-Curricular courses (CCC):

a. Assessment of the CCC course shall be done by the respective course coordinator as a part of CA and be based on the regularity, performance of a student and his participation in various activities as prescribed in the regulations prepared in this regard.

b. The End Semester Assessment (ESA) of the CCC courses shall be done as per the regulations prepared in this regard and shall be done on the basis of the write-up, presentation by the student on the activities that he has carried out in a semester.

c. Students shall have freedom to opt for more than one CCC courses. However, score of the best performing CC shall be considered for preparing his result.

F. Syllabi, Teaching and Examination Scheme for the courses in Column 7 and Column 8 (AEC, VEC, IKS, CI, EVS, CCCs, etc.) shall be common for all the students from different faculties.

Note: Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course45 lectures.

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