॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

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

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

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Phone: (02462)215542 | E-mail: bos@srtmun.ac.in

विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २७ मे २०२५ रोजी संपन्न झालेल्या मा. विद्यापरिषद बैठकीतील विषय क्रमांक १६/६१–२०२५ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसारचे पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यास मा. विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी. एस्सी द्वितीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यात येत आहेत.

01	B.Sc. Agriculture Microbiology	11	B.Sc. Physics
02	B.Sc. Botany	12	B.Sc. Seed Technology
03	B.Sc. Dairy Science	13	B.Sc. Horticulture
04	B.Sc. Electronics	14	B.Sc. Statistics
05	B.Sc. Environmental Science	15	B.Sc. Biochemistry
06	B.Sc. Fishery Science	16	B.Sc. Analytical Chemistry
07	B.Sc. Food Science	17	B.Sc. Agrochemical & Fertilizers
08	B.Sc. Geology	18	B.Sc. Industrial Chemistry
09	B.Sc./B.A. Mathematics	19	B.Sc. Industrial Microbiology
10	B.Sc. Microbiology		

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

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२५–२६/११६
दिनांक ०५.०६.२०२५

सहाय्यक कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : माहितीस्तव तथा कार्यवाहीस्तव.
१) मा. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
२) मा. प्र. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
३) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परीक्षा व मुंल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

SWAMI RAMANAND TEERTHMARATHWADA UNIVERSITY, NANDED - 431 606 (MS)

UNDERGRADUATE PROGRAMME OF

SCIENCE & TECHNOLOGY

B.Sc. Second Year

SEED TECHNOLOGY

(For Affiliated Colleges)

Effective from the Academic year 2025 – 2026

(As per NEP-2020)

Framed by

BOARD OF STUDIES IN BOTANY

S.R.T.M. University, Nanded - 431 606

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 ***Sukanu Samiti*** 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
Swami Ramanand Teerth Marathwada University,
Nanded

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

PREAMBLE

The B.Sc. Seed Technology semester pattern course is running in different affiliated colleges 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 SkillEnhancement 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) Botany offers knowledge of areas including Plant Systematics, Plant Biotechnology, Resource Botany, Genetics, Ecology, Conservation biology, Physiology and Bioinformatics, Medicinal plants, Plant diseases management 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 Botany. The course also offers skills to pursue research and teaching in the field of Botany and thus would produce best minds to meet the demands of society This curriculum framework for the bachelor-level program in Botany 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. The addition of Generic Electives, Vocational and SkillEnhancement Coursesaims to develop skills in plant sciences and practical experience in the students.

OBJECTIVES OF THE B. Sc. SEED TECHNOLOGY PROGRAMME:

The Objectives 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. Saheb Laxmanrao Shinde**	Chairman	Yeshwant Mahavidylaya, Nanded	7588151967
2	**Dr. Babasaheb Shivmurti Surwase**	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 Tulshiram Gorgile**	Member	Shahir Annabhau Sathe Mahavidyalaya, Mkhed	9421762073
5	**Dr. Sudhakar V. Chate**	Member	Shivaji College, Udgir	8421241300
6	**Dr. Suresh Manoharrao Telang**	Member	Yeshwant Mahavidyalaya, Nanded	9822174684
7	**Dr. R. M. Kadam**	Member	M. G. M. Ahmedpur, Tq. Ahmedpur, Dist. Latur.	9422657976
8	**Dr. Sopan Dnyanoba Dhavale**	Member	Shahir Annabhau Sathe Mahavidyalaya, Mukhed,	9423614703
9.	**Dr. Sanjay Marotrao Dalvi**	Member	Shri Guru Buddhiswami Mahavidyalaya, Purna (Jn),	9921101210
10	**Dr. Prashant A. Gawande**	Professor from other University	Sant Gadge Baba Amravati University,Amravati.	9403622568
11	**Dr. Ambadas Sheshrao Kadam**	Experts	DSM College Parbhani.	8329151172
12	**Dr. Kanhaiya Ranganathrao Kadam**	Experts	K.K. Herbal Industries, Gut No. 252, Naleshwar Road, Limbgaon, Nanded.	9420261080
13	**Bindu Maurya**	Experts	07, Mangal Pravesh building Polt. C-16 Sector-3 Airoli, Navi Mumbai.	9987591561
14	**Shri Bhanudas Balajirao Pendkar**	Experts	K-Ferts Lab, W-4, MIDC Industrial Area, Nanded. Invitee Member	8888896710

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Credit Framework for B.Sc.II Year

Multidisciplinary Degree Program with Multiple Entry and Exit

Subject: SEED TECHNOLOGY(Major) /SEED TECHNOLOGY (Minor)

Year & Level	Semester	Major *(From the same Faculty)*	Minor 1 *(From the same Faculty)*	(Minor 2) *(From the same Faculty)*	Generic Elective (GE) (select from Basket 3 of *Faculties other than Science and Technology*)	Vocational & Skill Enhancement Course	Ability Enhancement Course (AEC) (Basket 4) Value Education Courses (VEC) / Indian Knowledge System (IKS) (Basket 5) *(Common across all faculties)*	Field Work / Project/Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CCC) (Basket 6 for CCC) *(Common across all faculties)*	Credits	Total Credits
1	2	3	4	5	6	7	8	9	10	11
2 (5.0)	III	SSTLCT1201 (2cr) SSTLCT1202 (2cr) SSTLCP1201 (2cr) SSTLCP1202 (2cr) 8 Credits	SSTLMT1201 (2Cr) SSTLMP1201 (2Cr) 4 Credits		SSTLGE1201 (2cr)	SSTLVC1201 2 Credits	ACEENG1201 (2cr) ACEMIL1201 (2Cr) 4 Credits	CCCXXX1201(2Cr) *(NCC/NSS/SPT(sports)/ CLS(Cultural Studies)/HWS(Health Wellness)/ YGE(Yoga Education) / FIT(Fitness)* 2 Credits	22	88
	IV	SSTLCT1251 (2cr) SSTLCT1252 (2cr) SSTLCP1251 (2cr) SSTLCP1252 (2cr) 8 Credits	SSTLMT1251 (2Cr) SSTLMP1251 (2Cr) 4Credits		SSTLGE1251 (2cr)	SSTLVC1251 2 Credits	ACEENG1201 (2cr) ACEMIL1201 (2Cr) VECEVS1251 (2Cr) 6 Credits		22	
	Cum. Cr.	24	16	08	08	08	22	02	44	
***Exit option*: UG Diploma in Major Seed Technologyand Minor Seed Technology on completion of 88 credits and** additional **4 credits NSQF / internship in Seed Technology**										

B. Sc. Second Year Semester III*(Level 5)*

Teaching Scheme

	Course Code	CourseName	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SSTLCT1201	**Principles of Seed Production**	02	--	**04**	02	--
	SSTLCP1201	**Practical based on SSTLCT 1201**	-	02			04
	SSTLCT1202	**Plant Breeding**	02	--	**04**	02	--
	SSTLCP1202	**Practical based on SSTLCT 1202**	-	02			04
Minor	SSTLMT1201	**Crop Improvement – I (Kharif Crop)**	02	--	**04**	02	--
	SSTLMP1201	**Practical based on SSTLMT 1201**	-	02			04
Generic Electives *(from other Faculty)*	SSTLGE1201	**(Basket 3)**	02	--	**02**	02	--
Vocational Course (related to Major)	SSTLVC1201	**Seed Health Technology**	--	02	**02**	--	04
Ability Enhancement Course	AECENG1201	L1 – Compulsory English	02	--	**02**	02	--
Ability Enhancement Course	**ACEMIL1201**	**(MAR/HIN/URD /KAN/PAL)**	02	--	**02**	02	--
(NCC/NSS/SPT(sports)/ CLS(Cultural Studies)/HWS(Health Wellness)/ YGE(Yoga Education) / FIT(Fitness) **2 Credits**	**CCCXXX1201**	Select from **Basket 5**	02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. Second Year Semester III*(Level 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)	
Major	SSTLCT1201	**Principles of Seed Production**	10	10	10	40	--	--	50
	SSTLCP1201	**Practical based on SSTLCT 1201**	--	--	--	--	20	30	50
	SSTLCT1202	**Plant Breeding**	10	10	10	40	--	--	50
	SSTLCP1202	**Practical based on SSTLCT 1202**	--	--	--	--	20	30	50
Minor	SSTLMT1201	**Crop Improvement – I (Kharif Crop)**	10	10	10	40	--	--	50
	SSTLMP1201	**Practical based on SSTLMT 1201**	--	--	--	--	20	30	50
Generic Electives	SSTLGE1201	**(Basket 3)**	10	10	10	40	--	--	50
Vocational Course	SSTLVC1201	**Seed Health Technology**	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1201	L1 – Compulsory English	--	--	--	--	20	30	50
Ability Enhancement Course	ACEMIL1201	**(MAR/HIN/URD /KAN/PAL)**	--	--	--	--	20	30	50
(NCC/NSS/SPT(sports)/ CLS(Cultural Studies)/HWS(Health Wellness)/ YGE(Yoga Education) / FIT(Fitness) **2 Credits**	CCCXXX1201	Select from **Basket 5**	10	10	10	40	--	--	50

B. Sc. Second Year Semester IV*(Level 5)*

Teaching Scheme

	Course Code	CourseName	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SSTLCT1251	**Fundamentals of Genetics**	02	--	**04**	02	--
	SSTLCP1251	**Practical based on SSTLCT 1251**	-	02			04
	SSTLCT1252	**Fundamentals of Plant Biochemistry and Biotechnology**	02	--	**04**	02	--
	SSTLCP1252	**Practical based on SSTLCT 1252**	-	02			04
Minor	SSTLMT1251	**Crop Improvement – II (Rabi Crop)**	02	--	**04**	02	--
	SSTLMP1251	**Practical based on SSTLMT 1251**	-	02			04
Generic Electives *(from other Faculty)*	SSTLGE1251	**(Basket 3)**	02	--	**02**	02	--
Vocational Course (related to Major)	SSTLVC1251	***Seed Quality Testing***	--	02	**02**	--	04
Ability Enhancement Course	AECENG1251	L1 – Compulsory English	02	--	**02**	02	--
Ability Enhancement Course	**ACEMIL1251**	**(MAR/HIN/URD /KAN/PAL)**	02	--	**02**	02	--
(NCC/NSS/SPT(sports)/ CLS(Cultural Studies)/HWS(Health Wellness)/ YGE(Yoga Education) / FIT(Fitness) **2 Credits**	**CCCXXX1251**	Select from **Basket 5**	02	--	**02**	02	--
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. Second Year Semester IV*(Level 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)	
Major	SSTLCT1251	**Fundamentals of Genetics**	10	10	10	40	--	--	50
	SSTLCP1251	**Practical based on SSTLCT 1251**	--	--	--	--	20	30	50
	SSTLCT1252	**Fundamentals of Plant Biochemistry and Biotechnology**	10	10	10	40	--	--	50
	SSTLCP1252	**Practical based on SSTLCT 1252**	--	--	--	--	20	30	50
Minor	SSTLMT1251	**Crop Improvement – II (Rabi Crop)**	10	10	10	40	--	--	50
	SSTLMP1251	**Practical based on SSTLMT 1251**	--	--	--	--	20	30	50
Generic Electives	SSTLGE1251	**(Basket 3)**	10	10	10	40	--	--	50
Vocational Course (related to Major)	SSTLVC1251	***Seed Quality Testing***	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1201	L1 – Compulsory English	--	--	--	--	20	30	50
Ability Enhancement Course	**ACEMIL1201**	**(MAR/HIN/URD /KAN/PAL)**	--	--	--	--	20	30	50
(NCC/NSS/SPT(sports)/ CLS(Cultural Studies)/HWS(Health Wellness)/ YGE(Yoga Education) / FIT(Fitness) **2 Credits**	**CCCXXX1201**	Select from **Basket 5**	10	10	10	40	--	--	50

Syllabus for B. Sc. Seed Technology, Second Year

Semester – III

As Per National Education Policy- 2020

To be Implemented from

Academic Year 2025-2026

National Education Policy 2020

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

Major Core Theory Course

Course Code – SSTLCT1201

Title of the Course: PRINCIPLES OF SEED PRODUCTION

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

Coursepre-requisite:

1. The course is offered for a student registered for undergraduate second year Programme in the Faculty of Science and Technology who had primary training in the field of plant sciences at undergraduate first year level, for entry level corecourses in Seed Technologyas Major subject.
2. Basic knowledge of crop production, growth requirements, and field management.
3. Understanding of genetic principles, plant breeding techniques, and their role in seed quality improvement.
4. Introductory knowledge of seed biology, seed certification, and seed industry operations.

Courseobjectives:

1. To impart knowledge about the principles and techniques involved in quality seed production of field and horticultural crops.
2. To educate students on the importance of seed certification, processing, and storage for maintaining seed viability and vigor.
3. To develop skills in handling, testing, and evaluating seed quality for commercial seed production and marketing.

Courseoutcomes:

1. Understanding Seed Production – Students will be able to explain the principles and methodologies of quality seed production for different crops.
2. Application of Seed Certification & Processing – Ability to apply seed certification standards, processing techniques, and storage practices for maintaining seed quality.
3. Practical Skills in Seed Industry – Develop hands-on expertise in seed sampling, testing, germination analysis, and viability assessment for commercial seed enterprises.

Curriculum Details:SSTLCT 1201-Principles of Seed Production

Iodule No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Seed quality concept & seed production**	**07**
	1.1	Concept of seed vigour,	
	1.2	Vigour test methods – standard germination test, cold test, Accelerated ageing test, Tetrazolium test and EC Test.	
	1.3	Factors affecting seed vigour,	
	1.4	Physiological basis of seed vigour in relation to crop performance & yield.	

2.0		**Hybrid seed production**	**08**
	2.1	Seed production in self-pollinated crops,	
	2.2	Seed production in cross pollinated crops,	
	2.3	Mode of pollination and reproduction in crop plants and their modification in relation to hybrid seed production.	
	2.4	Principles of hybrid seed production, isolation distance, synchronization of flowering, rouging etc.	
3.0		**Agronomy of seed production**	**08**
	3.1	Male sterility and incompatibility system in hybrid seed production, Role of pollinators and their management,	
	3.2	Seed multiplication ratios,	
	3.3	seed replacement rate,	
	3.4	demand and supply; Suitable areas of seed production and storage, agronomy of seed production – agro-climatic requirements and their influence on quality seed production;	
4.0		**Seed multiplication and hybrid development methods**	**07**
	4.1	Generation system of seed multiplication; Life span of a variety	
	4.2	Causes for seed deterioration;	
	4.3	Certification standards for self and cross pollinated and vegetatively propagated crops.	
	4.4	Hybrid Seed - Methods of development of hybrids; use of male sterility. Self-incompatibility and CHA in hybrid seed production; One, two and three line system; maintenance of parental lines of hybrids;	
		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.

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

Major Core Theory Course

Course Code – SSTLCT1202

Title of the Course: PLANT BREEDING

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

Coursepre-requisite:

1. Basic understanding of Mendelian and molecular genetics, inheritance patterns, and genetic variation.
2. Knowledge of different crop species, their growth habits, and their importance in agriculture.
3. Introductory concepts related to seed production, seed viability, and quality control in crop improvement programs.

Courseobjectives:

1. To introduce students to the fundamental principles and techniques of plant breeding for crop improvement.
2. To educate students on different breeding methods such as selection, hybridization, mutation breeding, and biotechnology in plant breeding.
3. To develop skills in evaluating and selecting superior genotypes for yield improvement, disease resistance, and stress tolerance.

Course outcomes:

1. Understanding Plant Breeding Concepts – Students will gain knowledge of classical and modern plant breeding techniques and their applications in crop improvement.
2. Application of Breeding Methods – Ability to implement breeding methods such as hybridization, mutation, and marker-assisted selection for developing improved crop varieties.
3. Practical Experience in Crop Improvement – Students will acquire hands-on skills in breeding program design, selection of parent lines, and evaluation of genetic gain in crop species.

Curriculum details:SSTLCT 1202- Plant Breeding

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction to plant breeding**	**07**
	1.1	Plant Breeding - Introduction, Objectives, Activities and important achievements	
	1.2	Modes of pollination in crop plants- self and cross pollination. Factors Promoting self & cross pollination,	
	1.3	Self incompatibility - Defination, Types, Methods, induction and application	
	1.4	Male sterility- Defination, Types, Methods, induction and application.	
2.0		**Germplasm Conservation Practices**	**08**

	2.1	Germplasm and it's conservation - Introduction, Types of Germplasm Collection,	
	2.2	N. I. Vavilov's centre of origin, and diversity, Seed banks and types of seed collection,	
	2.3	Plant Introduction - Definition, types, procedure, merits and demerits,	
	2.4	Selection - Definition, types, methods, merits and demerits.	
3.0		**Hybridizations Techniques**	**08**
	3.1	Hybridization - Definition objective and types, Techniques of Hybridization – (Selection evaluation of parents, Emasculation, Bagging and Tagging) Pollination, Collection and storage of F1 Seed, Growing of F1 Generation,	
	3.2	Improvement of self pollinated crops through hybridization application,	
	3.3	Procedure merits and demerits and achievements of pedigree methods.	
	3.4	Procedure merits and demerits and achievements of bulk methods.	
4.0		**Heterosis and Mutaion Breeding**	**07**
	4.1	Heterosis, Definition types and basis,	
	4.2	Use of heterosis in crop improvements,	
	4.3	Hybrid, Synthetic and Composite Varieties.	
	4.4	Mutation Breeding- Introduction, Mutagens, procedure, precautions, application and achievements.	
		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.

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

Major Practical Course

Course Code – SSTLCP 1201

Title of the Course: Practical based on SSTLCT 1201

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

Coursepre-requisite:

1. Basic understanding of seed biology, seed structure, and quality parameters.
2. Knowledge of genetic purity, hybridization, and varietal development.
3. Understanding of crop production practices, pollination mechanisms, and environmental factors affecting seed production

Courseobjectives:

1. To provide hands-on training in seed production techniques, including selection of parental lines, pollination control, and isolation methods.
2. To develop skills in seed processing, testing, and certification to ensure quality seed production.
3. To train students in practical field management for hybrid and open-pollinated seed production under different agro-climatic conditions.

Courseoutcomes:

1. Practical Knowledge of Seed Production – Students will gain field-level experience in the techniques of producing genetically pure and high-quality seeds.
2. Application of Seed Quality Assurance Techniques – Ability to perform seed testing, isolation, and certification procedures in seed production programs.
3. Skill Development in Field Inspection & Harvesting – Hands-on expertise in monitoring seed crops, handling post-harvest processing, and maintaining seed viability and vigor

Curriculumdetails:SSTLCP 1201: Practical based on SSTLCT 1201

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Identification of seed characteristics of agricultural crops	8
2.		
3.	Identification of morphological features of horticultural crops	8
4.		
5.	Visit to breeder seed production unit	4
6.	Planting design and identification of rogues and off types in varieties and hybrids of agricultural crops	8
7.		
8.	Study of supplementary pollination and pollen management techniques in seed production.	4

9.	Hybrid seed production techniques in agricultural crops.	4
10.	Study of physiological maturity indices for crops	4
11.	Influence of grading techniques on seed quality characters.	4
12.	Planning seed production for different classes of seeds in varieties of agricultural crops	4
13.	Planning seed production for different classes of seeds in hybrids of agricultural crops	4
14.	Cost benefit ratio for seed production	4
15.	Visit to seed production field and processing unit	4
	Total	**60**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi.
2. **Chhabra, A.K.**2006.**Practical Manual of Floral Biology of Crop Plants**. Dept. of Plant Breeding, CCS HAU, Hisar.
3. **Desai, B.B.** 2004**. Seeds Handbook. Marcel Dekker,** New York.
4. **Poehlman, L.M. & Sleper, D.A.** 2006. **Breeding of Field Crops.** Blackwell Publishing, Ames, IA, USA.
5. **Singh, B.D.** 2005**. Plant Breeding: Principles and Methods.** Kalyani Publishers, New Delhi.
6. **Thompson, J.R.** 1979**. An Introduction to Seed Technology.** Leonard Hill, UK.

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **McDonald, M.B. & Copeland, L.O.** 1997**. Seed Production: Principles and Practices.** Chapman & Hall, New York.
3. **Singhal, N.C.** 2003**. Hybrid Seed Production in Field Crops.** Kalyani Publishers, New Delhi.
4. **Tunwar, N.S. & Singh, S.V.** 1985**. Handbook of Cultivars.** CSCB, GOI. New Delhi.

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

Major Practical Course

Course Code – SSTLCP1202

Title of the Course: Practical based on SSTLCT 1202

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

Coursepre-requisite:

1. Basic understanding of Mendelian genetics, gene interactions, and inheritance patterns.
2. Knowledge of crop growth stages, pollination mechanisms, and field management.
3. Understanding of seed quality, hybridization, and varietal purity in crop improvement.

Courseobjectives:

1. To provide hands-on training in plant breeding techniques, including hybridization, selection, and controlled pollination.
2. To develop skills in identification, evaluation, and selection of superior plant genotypes for yield improvement and disease resistance.
3. To train students in field layout, data collection, and analysis of breeding trials for developing new crop varieties.

Courseoutcomes:

1. Practical Knowledge of Breeding Techniques – Students will gain field experience in crossing techniques, emasculation, and artificial pollination.
2. Application of Selection Methods – Ability to identify and select superior plants using pedigree selection, bulk selection, and hybrid breeding.
3. Skill Development in Field Trials & Data Analysis – Hands-on expertise in conducting field experiments, recording agronomic traits, and interpreting breeding data.

Curriculum details:SSTLCP 1202: Practical based on SSTLCT 1202

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Plant Breeder's kit	4
2.	Study of germplasm of various crops	4
3.	Study of floral structure of self pollinated crops	4
4.	Study of floral structure of cross pollinated crops	4
5.	Emasculation and hybridization techniques in self pollinated crops : Green gram and Black gram	4
6.	Emasculation and hybridization techniques in self pollinated crops : Rice and Wheat	4
7.	Emasculation and hybridization techniques in self pollinated crops : Groundnut and Soybean	4
8.	Emasculation and hybridization techniques in self pollinated crops : Okra, Tomato, Brinjal and Chilli etc.	4

9.	Emasculation and hybridization techniques in cross pollinated crops : Maize and Bajra	4
10.	Emasculation and hybridization techniques in cross pollinated crops : Papaya and Sugarcane etc.	4
11.	Emasculation and hybridization techniques in often cross pollinated crops : Cotton	4
12.	Emasculation and hybridization techniques in often cross pollinated crops : Sorghum	4
13.	Emasculation and hybridization techniques in often cross pollinated crops : Pigeonpea	4
14.	Emasculation and hybridization techniques in often cross pollinated crops : Safflower and Sunflower	4
15.	Study of male sterility system	4
	Total	**60**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi
2. **Chopra V. L., Plant Breeding Theory and Practices**, Oxford and IBH. Publishing Company , New Delhi. .
3. **Choudhary R. C., Elementary Principles of Plant Breeding**, Oxford and IBH. Publishing Company , New Delhi.
4. **Phundan singh, Essentials of Plant Breeding,** Kalyani Publishers, New Delhi.
5. **Poehlman, L.M. & Sleper, D.A.** 2006. **Breeding of Field Crops.** Blackwell Publishing, Ames, IA, USA.
6. **Singh, B.D.** 2005**. Plant Breeding: Principles and Methods.** Kalyani Publishers, New Delhi.
7. **Thompson, J.R.** 1979**. An Introduction to Seed Technology.** Leonard Hill, UK.

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **McDonald, M.B. & Copeland, L.O.** 1997**. Seed Production: Principles and Practices.** Chapman & Hall, New York.
3. **Singhal, N.C.** 2003**. Hybrid Seed Production in Field Crops.** Kalyani Publishers, New Delhi.
4. **Singh, B.D,** 2018, **Plant Breeding Principles and Methodology,** Kalyani Publishers, New Delhi.
5. **Sharma J. R., Principles and Practices Plant Breeding,** McGraw Hill Publishing company Limited , New Delhi.
6. **Tunwar, N.S. & Singh, S.V.** 1985**. Handbook of Cultivars.** CSCB, GOI. New Delhi.

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

Minor Theory Course

Course Code – SSTLMT1201

Title of the Course: Crop Improvement-I (Kharif Crop)

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

Coursepre-requisite:

1. Basic understanding of inheritance, genetic variation, and breeding methods for crop improvement.
2. Knowledge of crop production practices, soil management, and environmental factors affecting Kharif crops.
3. Understanding seed production techniques, seed certification, and quality control essential for crop improvement.

Courseobjectives:

1. To educate students on the breeding methods and genetic improvement of major Kharif (rainy season) crops such as rice, maize, sorghum, pearl millet, and pulses.
2. To develop an understanding of varietal development, hybridization, and biotechnology applications in Kharif crop breeding.
3. To train students in evaluation and selection techniques for improving yield, disease resistance, and climate adaptability of Kharif crops.

Courseoutcomes:

1. Knowledge of Kharif Crop Breeding – Students will gain expertise in crop improvement strategies for major Kharif crops.
2. Application of Crop Improvement Techniques – Ability to apply selection, hybridization, and biotechnological tools for developing superior crop varieties.
3. Practical Skills in Field Trials & Variety Development – Students will acquire hands-on experience in conducting breeding trials, evaluating crop performance, and selecting improved genotypes for agricultural sustainability.

Curriculumdetails:SSTLMT1201:Crop Improvement-I (Kharif Crop)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**N. I. Vavilov's Concept of centre of origin**	**08**
	1.1	Centre of origin- Introduction and concept	
	1.2	Cereals - Rice, Maize, Sorghum, Pearl millet, finger millet.	
	1.3	Pulses - Pigeonpea, Urdbean, Black gram, Mung bean, Cowpea, Soybean.	
	1.4	Oil seed - Groundnut, Castor, Sesame, Sunflower.	
2.0		**PGR and Germplasm Conservation**	**07**
	2.1	Definition of PGR,	

	2.2	Gene pool, Kinds of germplasm, gene pool concept,	
	2.3	Genetic erosion, Gene bank concept.	
	2.4	Germplasm collection and conservation, Types and methods.	
3.0		**Conventional Breeding methods**	
	3.1	Introduction, Mass selection, pure line selection,	**08**
	3.2	Pedigree method, Bulk method and backcross method along with examples of varieties.	
	3.3	Modern innovative approaches - somatic Hybridization, Micropropagation	
	3.4	Transgenic breeding and marker assisted selection.	
4.0		**Ideotype breeding**	
	4.1	Ideotype concept in crop improvement- Introduction,	**07**
	4.2	Types of ideotype, characteristics of ideotype, Major steps in ideotype breeding,	
	4.3	Ideotype of Rice, wheat, Sorghum, practical achievements, merits and demerits.	
	4.4	Characteristics of climate resilient crops Viz. Wheat, Sorghum, maize, soybean, cotton.	
		Total	**30**

Text Books and Reference Books:

Text Books:

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

Reference Books:

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

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

Major Practical Course

Course Code – SSTLMP1201

Title of the Course: Practical based on SSTLMT 1201

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

Coursepre-requisite:

1. Basic understanding of inheritance, hybridization techniques, and genetic diversity in crop improvement.
2. Knowledge of seed production, quality parameters, and certification relevant to Kharif crops.
3. Understanding of Kharif crop management, environmental conditions, and field operations.

Courseobjectives:

1. To provide hands-on training in breeding techniques and varietal improvement of major Kharif crops like rice, maize, sorghum, cotton, and pulses.
2. To develop skills in selection, hybridization, and evaluation of crop varieties for high yield, disease resistance, and stress tolerance.
3. To train students in field trials, genetic purity maintenance, and data recording techniques for crop improvement research

Courseoutcomes:

1. Practical Knowledge of Kharif Crop Breeding – Students will gain field-level experience in hybridization, selection, and improvement of major Kharif crops.
2. Application of Crop Improvement Techniques – Ability to perform breeding trials, selection of desirable traits, and disease resistance screening.
3. Skill Development in Field Experimentation & Data Collection – Hands-on expertise in laying out breeding trials, analyzing agronomic performance, and maintaining varietal purity.

Curriculumdetails:SSTLMP 1201: Practical based on SSTLMT 1201

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Emasculation and hybridization techniques in different crop species : Rice, Maize	4
2.	Emasculation and hybridization techniques in Sorghum & Pearl Millet	4
3.	Emasculation and hybridization techniques in Ragi&Pigeonpean	4
4.	Emasculation and hybridization techniques in Urdbean&Mungbean, Soybean	4
5.	Emasculation and hybridization techniques in Groundnut, Seasame& Sunflower	4
6.	Emasculation and hybridization techniques in Caster, Cotton	4
7.	Emasculation and hybridization techniques in Cowpea & Tobacco	4
8.	Maintenance breeding of different Kharif crops	4
9.	Handling of germplasm and segregating populations by different methods	4

	like pedigree, bulk and single seed decent methods	
10.	Study of field techniques for seed production and hybrid seeds production in Kharif crops	4
11.	Estimation of heterosis, inbreeding depression and heritability	4
12.	Layout of field experiments	4
13.	Study of quality characters, donor parents for different characters	4
14.	Visit to seed production plots	4
15.	Visit to AICRP plots of pulse & sorghum	4
	Total	**60**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi
2. **Chahal G. S. and S. S. Gosla., Principle and Procedures of Plant Breeding Biotechnological and Conventional Approach,** Narosa Publishers House. New Delhi.
3. **HariHar Ram., Crop Breeding and Biotechnology.,** KalyaniPublication New Delhi.
4. **Poehlman J.M., Breeding of Asian Field crops,** Blackwell Publishers.
5. **Singh B. D., Plant Breeding Principle and Methods.,** KalyaniPublication New Delhi.

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **HariHar Ram., Crop Breeding and Biotechnology.,** KalyaniPublication New Delhi.
3. **Poehlman J.M., Breeding of Asian Field crops,** Blackwell Publishers.
4. **Singh B. D., Plant Breeding Principle and Methods.,** KalyaniPublication New Delhi.

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

Generic Elective Course

Course Code – SSTLGE 1201

Title of the Course: EMERGING TRENDS IN SEED QUALITY ENHANCEMENT

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

Course pre-requisite:

1. Basic understanding of seed biology, quality parameters, and certification processes.
2. Knowledge of breeding techniques and their role in seed quality improvement.
3. Understanding of molecular tools and biotechnological advancements in seed enhancement.

Course objectives:

1. To introduce students to the latest advancements in seed quality enhancement techniques, including priming, coating, pelleting, and biostimulants.
2. To educate students on the role of nanotechnology, biotechnology, and organic treatments in improving seed vigor, viability, and germination.
3. To provide hands-on experience in modern seed enhancement technologies to improve crop productivity and sustainability

Course outcomes:

1. Understanding of Advanced Seed Quality Enhancement – Students will gain knowledge of innovative techniques like priming, coating, and nanotechnology for seed quality improvement.
2. Application of Biotechnological and Organic Treatments – Ability to implement molecular and organic strategies for enhancing seed performance.
3. Practical Skills in Seed Quality Assessment – Students will develop hands-on expertise in testing, evaluating, and applying advanced seed enhancement technologies for sustainable agriculture.

CURRICULUMDETAILS:SSTLGE1201: Emerging Trends in Seed Quality Enhancement

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Concept of Seed Quality Enhancement**	**07**
	1.1	Concept and significance of seed quality enhancement;	
	1.2	History, principles and methods of seed treatment, methodology	
	1.3	Physical, chemical and pesticidal seed treatments,	
	1.4	Factors affecting seed enhancement treatments.	
2.0		**Seed priming**	**08**
	2.1	Seed priming: physiological and biochemical basis	
	2.2	Types of priming technology	
	2.3	Biochemical and molecular changes associated with pregermiantion.	
	2.4	Seed colouring and biopriming.	

3.0		**Coating and Pelleting**	
	3.1	Film coating and pelleting,	**07**
	3.2	Seed tapes and seed mats	
	3.3	Synthetic seeds – Aim and scope for synthetic seeds,	
	3.4	Historical development in synthetic seeds	
4.0		**Somatic embryogenesis**	
	4.1	Somatic embryogenesis, somaclonal variation and their control	**08**
		Embryo encapsulation systems, hardening of artificial seeds	
	4.3	Cryo-preservation, storage of artificial seeds,	
	4.4	Desiccation tolerance, use of botanicals in improving seed quality etc.	
		Total	**30**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi
2. **Basra AS. (Ed.).** 1995**. Seed Quality: Basic Mechanisms and Agricultural Implications .** 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. Perspective . Associated Publishing Company, New Delhi.
5. **Kalloo G, Jain SK, Vari AK & Srivastava U.** 2006**. Seed: A Global**

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
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. Perspective . Associated Publishing Company, New Delhi.
5. **Kalloo G, Jain SK, Vari AK & Srivastava U.** 2006**. Seed: A Global**

National Education Policy 2020

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

Skill Enhancement Course

Course Code – SSTLVC1201

Title of the Course: Seed Heath Technology

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

Coursepre-requisite:

1. Basic knowledge of seed biology, quality parameters, and certification standards.
2. Understanding of seed-borne diseases, pathogen detection, and control methods.
3. Knowledge of beneficial and harmful microorganisms affecting seed health.

Course objectives:

1. To educate students on the importance of seed health in maintaining crop productivity and preventing disease outbreaks.
2. To introduce methods for detecting seed-borne pathogens and strategies for their control, including biological, chemical, and physical treatments.
3. To provide hands-on training in seed health testing, seed treatment technologies, and regulatory guidelines for disease-free seed production

Course outcomes:

1. Understanding of Seed Health and Pathology – Students will gain knowledge of seed-borne pathogens, their impact, and methods for maintaining seed health.
2. Application of Seed Treatment Techniques – Ability to apply biological, chemical, and physical seed treatments to control seed-borne diseases.
3. Practical Skills in Seed Testing & Quality Control – Students will develop expertise in disease detection methods, seed health certification, and compliance with phytosanitary standards.

CURRICULUMDETAILS:SSTLVC 1201: Seed Health Technology

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	**Study of commonly occurring seed - borne fungi.** Alternaria, Curvularia etc	4
2.	**Study of commonly occurring seed - borne fungi.** Drechslera, Fusarium	4
3.	**Study of commonly occurring seed - borne fungi.** Collectotrichum, Phoma, Macrophomina,	4
4.	**Study of commonly occurring seed - borne fungi.** Aspergillus, Rhizopus, Penicillium.	4
5.	**Methods of examination of seed borne fungi.** Visual and microscopic examination of dry seed.	4
6.	**Methods of examination of seed borne fungi.** Seed washing test.	4
7.	**Incubation methods.** Detection of seed borne fungi by blotter method Detection of seed borne fungi by agar plate method	4

8.	**Incubation methods.** Detection of seed borne fungi by freezing method Detection of seed borne fungi by 2-4 D method	4
9.	**Incubation methods.** Detection of internal seed borne fungi by component plating method	4
10.	Detection of embryo borne (Ustilago nuda tritici) loose smut of Wheat by Embryo count method.	4
11.	**Study of seedling symptom test** a) Test tube plain agar method b) Hiltner's bricks stone method c) Sand method d)Standard soil method.	4
12.	**Detection of seed borne bacteria** a) Water agar plate method.	4
13.	**Detection of seed borne bacteria** a) Quartze sand method	4
14.	**Detection of seed borne viruses** a) Examination of dry seed sample Growing on test	4
15.	**Detection of externally and internally seed borne pathogens by nucleic acid based techniques** a) RFLP, PCR, Serological techniques like ELISA	4
	Total	**60**

Text Books and Reference Books:

Text Books:

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.

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **Agrawal RL.** 1996. **Seed Technology .** Oxford Publ.
3. **Hutchins J.D & Reeves J.E. (Eds.).** 1997**. Seed Health Testing:** Progress Towards the 21st Century. CABI, Wallington.
4. **Paul Neergaard.** 1988**. Seed Pathology.** MacMillan, London
5. **Suryanarayana D.** 1978**. Seed Pathology.** Vikash Publ., New Delhi.

Semester – IV

B.Sc. II Year

Seed Technology

As Per National Education Policy- 2020

National Education Policy 2020

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

Major Core Theory Course

Course Code – SSTLCT1251

Title of the Course: FUNDAMENTALS OF GENETICS

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

Coursepre-requisite:

1. Understanding of cell structure, DNA, RNA, and proteins.
2. Basic knowledge of plant structure, growth, and reproduction.
3. Awareness of crop species, their genetic diversity, and breeding relevance

Courseobjectives:

1. To introduce students to basic principles of genetics, including Mendelian and non-Mendelian inheritance.
2. To provide knowledge on chromosome structure, gene interactions, and molecular genetics.
3. To develop skills in genetic analysis, mutation studies, and applications of genetics in plant breeding.

Courseoutcomes:

1. Understanding of Genetic Principles – Students will comprehend Mendelian laws, gene interactions, and chromosomal behavior.
2. Application of Genetic Concepts in Crop Improvement – Ability to analyze inheritance patterns and apply genetic principles in plant breeding.
3. Practical Skills in Genetic Analysis – Hands-on experience in performing genetic crosses, studying mutations, and applying molecular tools in genetics.

CURRICULUMDETAILS:SSTLCT1251: Fundamentals of Genetics

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Pre and post Mendelian concepts of heredity**	**07**
	1.1	Pre Mendelian concepts: (500 BC -1850 A.D.), Pre formation Theory, Epigenesis.	
	1.2	Theory of Acquired characters, Theory of Pangenes, Germplsm theory and Others.	
	1.3	Contributions during Mendelian era, Post Mendelian concepts: Contributions during Post- Mendelian era and recent advances after 1900.	
	1.4	Role of different disciplines in the advancement of Genetics. Impact of Genetics and its applications in different disciplines (Role in Agriculture).	
2.0		**Mendelian principles of heredity and Cell division**	**08**
	2.1	Laws of Mendel, Reasons of Mendel's success, Mendelian deviations or exceptions or anomalies,	

	2.2	Cell division: Mitosis, Meiosis: Cell: Ultra structure, Cell organelles & their functions. Types of Cell, Difference between animal cell and plant cell.	
	2.3	Stages of mitosis and meiosis.	
	2.4	Significance of mitosis and meiosis, Difference between mitosis and meiosis.	
3.0		**Gene interaction, Epistasis interactions with examples**	**07**
	3.1	Difference and similarities between epistasis and dominance	
	3.2	Recessive epistasis and Dominant epistasis (Simple epistasis)	
	3.3	Dominant Inhibitory epistasis (Inhibitory gene action), Duplicate recessive epistasis (Complementary gene action),	
	3.4	Duplicate dominant epistasis (Duplicate gene action), Polymeric gene action, Typical dihybrid ratio.	
4.0		**Sex determination and sex linkage, Sex limited and sex influenced traits, Linkage and its estimation**	**08**
	4.1	Introduction, Importance of Sex determination	
	4.2	Difference between autosomes and allosomes.	
	4.3	Sex linked characters: (Colour blindness in human being) Difference between Sex limited and sex influenced traits,	
	4.4	Linkage and its estimation: Introduction, Features of Linkage, Phases of Linkage,	
		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.

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

Major Core Theory Course

Course Code – SSTLCT1252

Title of the Course: FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY

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

Coursepre-requisite:

1. Basic knowledge of cell structure, biomolecules, and metabolic processes.
2. Understanding of DNA, RNA, gene expression, and inheritance.
3. Basic concepts of organic and inorganic chemistry relevant to biochemical reactions.

Courseobjectives:

1. To provide foundational knowledge of biochemical processes in plants, including metabolism, enzyme functions, and biomolecules.
2. To introduce students to biotechnological tools and techniques used in agriculture, such as genetic engineering, tissue culture, and molecular markers.
3. To develop practical skills in biochemical and biotechnological applications, including plant tissue culture, enzyme assays, and DNA isolation

Course outcomes:

1. Understanding of Plant Biochemistry – Students will gain knowledge of plant biomolecules, enzymatic functions, and metabolic pathways.
2. Application of Biotechnology in Agriculture – Ability to apply genetic engineering, molecular markers, and tissue culture techniques in crop improvement.
3. Practical Skills in Laboratory Techniques – Hands-on experience in biochemical analysis, plant tissue culture, and molecular biology experiments.

CURRICULUMDETAILS:SSTLCT 1252: Fundamentals of Plant Biochemistry and Biotechnology

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introductory Plant Biochemistry**	**07**
	1.1	Importance of Biochemistry,	
	1.2	Properties of Water, pH and Buffer	
	1.3	Biomolecules - Definition, types, structure, properties and its applications, Importance.	
	1.4	Classification and Structures of Carbohydrate, Lipid, fatty acids, Proteins.	
2.0		**Carbohydrate, Lipid, Fatty Acids and Proteins**	**08**
	2.1	Carbohydrate: Importance and classification. Structures,	
	2.2	Lipid: Importance and classification; storage lipids and membrane lipids.	
	2.3	Structures and properties of fatty acids;	

	2.4	Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins.	
3.0		**Introductory Plant Biotechnology**	**07**
	3.1	Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA	
	3.2	Introduction and process of recombinant DNA technology	
	3.3	PCR techniques and its applications.	
	3.4	Organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications;	
4.0		**Recent Advances in Plant Biotechnology**	**08**
	4.1	Micro-propagation methods; organogenesis and embryogenesis,	
	4.2	Synthetic seeds and their significance; Embryo rescue and its significance;	
	4.3	somatic hybridization and cybrids somaclonal variation and its use in crop improvement	
	4.4	Marker Assisted Breeding in crop improvement	
		Total	**30**

Text Books and Reference Books:

Text Books:

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

Reference Books:

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

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

Major Practical Course

Course Code – SSTLCP1251

Title of the Course: Practical based on SSTLCT 1251

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

Coursepre-requisite:

1. Understanding of cell structure, DNA, RNA, and fundamental biological processes.
2. Basic knowledge of Mendelian and non-Mendelian inheritance, gene interactions, and chromosome structure.
3. Awareness of plant reproduction, pollination, and breeding methods

Courseobjectives:

1. To provide hands-on training in genetic principles, including inheritance patterns, gene expression, and mutations.
2. To develop skills in experimental techniques such as genetic crosses, pedigree analysis, and chromosomal studies.
3. To train students in data collection, interpretation, and analysis of genetic traits in plants

Courseoutcomes:

1. Practical Understanding of Genetic Principles – Students will gain knowledge of Mendelian inheritance, gene mapping, and chromosomal variations through experiments.
2. Application of Genetic Analysis Techniques – Ability to conduct genetic crosses, observe trait segregation, and analyze phenotypic and genotypic ratios.
3. Skill Development in Laboratory Experiments & Data Interpretation – Hands-on expertise in DNA extraction, mutation studies, and application of molecular genetics tools

CURRICULUMDETAILS:SSTLCP 1251: Practical based on SSTLCT 1251

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Study of microscopes	4
2.	Study of cell structure	4
3.	Preparation of microscopic Slides of mitosis - onion root tips	4
4.	Preparation of microscopic Slides of meiosis – tradescantia/onion /Wheat inflorescence	4
5.	Methods of finding out the gametes and gameticrecombination	4
6.	Problems on monohybrid ration and its modification	4
7.	Problems on dihybrid ratio and its modification	4
8.	Experiments on test cross and back cross	4

9.	Gene interaction – I Gene interaction without modification of F2ratio (comb-shape) and complementary gene interaction.	4
10.	Gene interaction – II Gene interaction with modification of F2ratio: supplementary factor, epistatis factor, inhibitory factor	4
11.	Gene interaction – III Gene interaction with modification of F2ratio: Additive factor, duplicate factor and lethal factor	4
12.	Problems on probability and Chi-square test	4
13.	Chi-square test Problems on	4
14.	Determination of linkage and cross over analysis (though two point test cross and three point test cross data)	4
15.	Study on sex linked inheritance in Drosophila	4
	Total	**60**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi
2. **Gupta. P. K., Genetics, Restogi publication Meerut**
3. **Phundan singh., Elements of Genetics,** Kalyani Publication, New Delhi
4. **Singh. B. D., Fundamentals of Genetics.,** Kalyani Publication, New Delhi.
5. **Strickbearger., M.W., Genetics,** Peerson education, Inc.
6. **Sushant Elrod and William Stansfield., Genetics,** McGraw Hill Publishing company Limited, New Delhi

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **Phundan singh., Elements of Genetics,** Kalyani Publication, New Delhi
3. **Strickbearger., M.W., Genetics,** Peerson education, Inc.

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

Major Practical Course

Course Code – SSTLCP1252

Title of the Course: Practical based on SSTLCT 1252

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

Coursepre-requisite:

1. Understanding of biomolecules (carbohydrates, proteins, lipids), enzymatic functions, and metabolic pathways.
2. Knowledge of DNA, RNA, gene expression, and genetic engineering basics.
3. Awareness of plant physiology, metabolic processes, and cellular functions.

Courseobjectives:

1. To provide practical exposure to biochemical analysis, including enzyme activity, protein estimation, and carbohydrate metabolism.
2. To develop skills in biotechnological tools and techniques, such as tissue culture, DNA extraction, PCR, and genetic transformation.
3. To train students in molecular biology experiments and biochemical assays for agricultural applications

Course outcomes:

1. Understanding of Biochemical & Biotechnological Concepts – Students will learn practical methods for analyzing biomolecules and genetic materials.
2. Application of Biotechnology in Agriculture – Ability to perform DNA extraction, PCR, electrophoresis, and tissue culture for crop improvement.
3. Skill Development in Laboratory Techniques – Hands-on expertise in enzyme assays, chromatography, molecular marker analysis, and plant tissue culture.

CURRICULUMDETAILS:SSTLCP 1252: Practical based on SSTLCT 1252

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Preparation of solution, pH & buffers	4
2.	Qualitative tests for carbohydrates	4
3.	Qualitative tests for amino acids	4
4.	Estimation of reducing sugars by Nelson-Somogyi method	4
5.	Estimation of starch by Anthrone method	4
6.	Determination of soluble protein by folin-lowry method	4
7.	Estimation of free amino acids by Ninhydrin method	4
8.	Determination of total crude fat/oil by Soxhlet method	4

9.	Qualitative tests for oil	4
10.	Determination of alpha amylase activity from germinating seed	4
11.	Determination of invivo nitrate reductase activity from leaf tissue	4
12.	Paper chromatography/ TLC demonstration for separation of amino acids	4
13.	TLC for separation of sugars	4
14.	Isolation of genomic DNA from plant. Purification, Quantification and quality determination	4
15.	Amplification of genomic DNA using different primers and resolution of PCR products on agarose gel	4
	Total	**60**

Text Books and Reference Books:

Text Books:

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

Reference Books:

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

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

Minor Theory Course

Course Code – SSTLMT1251

Title of the Course: CROP IMPROVEMENT – II (RABI CROP)

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

Coursepre-requisite:

1. Understanding of inheritance, breeding methods, and genetic variation.
2. Knowledge of crop production practices, soil management, and environmental factors affecting Rabi crops.
3. Understanding of seed production, quality control, and certification in crop improvement

Courseobjectives:

1. To educate students on the breeding techniques and genetic improvement of major Rabi (winter season) crops, such as wheat, barley, chickpea, mustard, and lentils.
2. To develop an understanding of varietal development, hybridization, and biotechnology applications in Rabi crop breeding.
3. To train students in evaluation, selection, and improvement techniques for developing high-yielding, disease-resistant, and climate-adapted Rabi crop varieties

Courseoutcomes:

1. Knowledge of Rabi Crop Breeding – Students will understand crop improvement strategies for major Rabi crops.
2. Application of Crop Breeding Techniques – Ability to use selection, hybridization, and molecular breeding tools for superior variety development.
3. Practical Skills in Variety Development & Field Trials – Hands-on experience in breeding trials, genetic evaluation, and selection of improved crop genotypes.

CURRICULUMDETAILS:SSTLMT 1251: Crop Improvement – II (Rabi Crop)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Crop Improvement in Cereals**	
	1.1	**Cereals** –Wheat, oat and barley - Centers of origin, Distribution of species, wild relatives,	
	1.2	Floral biology of Major Cereals –Wheat, oat and barley	**08**
	1.3	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)	
2.0		**Crop Improvement in Pulses**	**07**

	2.1	**Pulses** –Chickpea- Centers of origin, Distribution of species and wild relatives.	
	2.2	Floral biology of chickpea. Green gram and Pea	
	2.3	Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,	
	2.4	Abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)	
3.0		**Crop Improvement in VegetableCrops**	
	3.1	**Vegetable**- Potato- Centers of origin, Distribution of species and wild relatives.	
	3.2	Floral biology of Potato and Onion	
	3.3	Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,	**07**
	3.4	Abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)	
4.0		**Crop Improvement in Horticultural Crops**	
	4.1	**Horticultural** crops- Mango, Aonla and Guava - Centers of origin, Distribution of species and wild relatives.	
	4.2	Floral biology of Horticultural crops-Mango, Aonla and Guava	
	4.3	Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,	**08**
	4.4	Abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)	
		Total	**30**

Text Books and Reference Books:

Text Books:

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

Reference Books:

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

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

Major Practical Course

Course Code – SSTLMP1251

Title of the Course: Practical based on SSTLMT 1251

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

Coursepre-requisite:

1. Basic knowledge of inheritance, hybridization, selection, and breeding techniques.
2. Understanding of seed quality parameters, certification, and multiplication techniques.
3. Knowledge of agronomic practices, growth stages, and environmental factors affecting Rabi crops.

Courseobjectives:

1. To provide practical training in breeding techniques for major Rabi crops such as wheat, barley, mustard, chickpea, and lentils.
2. To develop skills in selection, hybridization, and evaluation of crop varieties for yield improvement and disease resistance.
3. To train students in field layout, genetic purity maintenance, and data collection techniques for crop improvement research.

Courseoutcomes:

1. Practical Knowledge of Rabi Crop Breeding – Students will gain hands-on experience in hybridization, selection, and improvement of Rabi crops.
2. Application of Crop Improvement Techniques – Ability to conduct breeding trials, select desirable traits, and assess disease resistance.
3. Skill Development in Field Experimentation & Data Analysis – Hands-on expertise in maintaining breeding trials, recording agronomic performance, and evaluating genetic purity

CURRICULUMDETAILS:SSTLMP 1251: Practical based on SSTLMT 1251

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Emasculation and hybridization techniques in wheat, oat & barley	4
2.	Emasculation and hybridization techniques in chickpea & lentil	4
3.	Emasculation and hybridization techniques in field pea, rapeseed & mustard	4
4.	Emasculation and hybridization techniques in sunflower	4
5.	Emasculation and hybridization techniques in potato &berseem	4
6.	Emasculation and hybridization techniques in sugarcane & cowpea	4
7.	Emasculation and hybridization techniques in safflower	4
8.	Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods	4
9.	Study of field techniques for seed production and hybrid seeds production	4

	in Rabi crops	
10.	Estimation of heterosis, inbreeding depression and heritability	4
11.	Layout of field experiments	4
12.	Study of quality characters, study of donor parents for different characters	4
13.	Visit to seed production plots	4
14.	Visit to AICRP plots of Safflower & Chickpea	4
15.	Visit to AICRP plots of Sunflower & Rabi sorghum	4
	Total	**60**

Text Books and Reference Books:

Text Books:

1. **Agarwal, P.K**. 1994. **Principles of Seed Technology**. ICAR, New Delhi
2. **Chahal G. S. and S. S. Gosla., Principle and Procedures of Plant Breeding Biotechnological and Conventional Approach,** Narosa Publishers House. New Delhi.
3. **HariHar Ram., Crop Breeding and Biotechnology.,** KalyaniPublication New Delhi.
4. **Poehlman J.M., Breeding of Asian Field crops,** Blackwell Publishers.
5. **Singh B. D., Plant Breeding Principle and Methods.,** KalyaniPublication New Delhi.

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **HariHar Ram., Crop Breeding and Biotechnology.,** KalyaniPublication New Delhi.
3. **Poehlman J.M., Breeding of Asian Field crops,** Blackwell Publishers.
4. **Singh B. D., Plant Breeding Principle and Methods.,** KalyaniPublication New Delhi.

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

Generic Elective Course

Course Code – SSTLGE 1251

Title of the Course: Seed Processing and Storage

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

Course pre-requisite:

1. Basic knowledge of seed biology, quality parameters, and certification standards.
2. Understanding of handling, drying, and storage techniques for agricultural produce.
3. Knowledge of crop production, harvesting, and seed handling practices

Course objectives:

1. To provide an understanding of seed processing techniques, including cleaning, grading, drying, and packaging to maintain seed quality.
2. To educate students on modern seed storage methods, including temperature control, moisture management, and pest prevention.
3. To develop practical skills in seed quality testing, processing equipment operation, and storage facility management.

Course outcomes:

1. Understanding of Seed Processing Techniques – Students will learn about seed cleaning, grading, drying, and packaging for maintaining seed viability.
2. Application of Modern Storage Methods – Ability to implement effective seed storage strategies to prevent deterioration and enhance shelf life.
3. Practical Skills in Seed Handling & Storage Management – Hands-on experience in seed quality assessment, processing machinery operation, and safe storage practices

CURRICULUMDETAILS:SSTLGE1251: Seed Processing and Storage

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction seed processing**	**07**
	1.1	Introduction: Principles of seed processing	
	1.2	Methods of seed drying including dehumidification and its impact on seed quality.	
	1.3	Relative humidity and equilibrium moisture content of seed; Thumb rules of seed storage.	
	1.4	Loss of viability in important agricultural and horticultural crops, viability equations and application of nomograph	

2.0		**Seed Cleaning**	**8**
	2.1	Principles of seed cleaning and methods of seed cleaning	
	2.2	Seed cleaning equipment and their functions	
	2.3	Preparing seed for processing; functions of scalper debearder, scarifier, huller, seed cleaner and grader	
	2.4	Screen cleaners, specific gravity separator, indented cylinder, velvet-spiral-disc separators, colour sorter, delinting machines	
3.0		**Seed blending**	**07**
	3.1	Assembly line of processing and storage, receiving, elevating and conveying equipments	
	3.2	Plant design and layout, requirements and economic feasibility of seed processing plant	
	3.3	Seed treatments-methods of seed treatment, seed treating formulations and equipments, seed disinfestations, identification of treated seeds	
	3.4	Packaging: principles, practices and materials; bagging and labeling	
4.0		**Seed Storage**	**08**
	4.1	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	
	4.2	Methods to minimize the loss of seed vigour and viability; factors influencing storage losses	
	4.3	Storage methods and godown sanitation. Storage structures	
	4.4	Storage problems of recalcitrant seeds and their conservation	
		Total	**30**

Text Books and Reference Books:

Text 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.** Vikas Publ.
7. **Virdi SS & Gregg BG.** 1970**. Principles of Seed Processing** . National Seed Corp., New Delhi

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **Agrawal RL.** 1996. **Seed Technology .** Oxford Publ.
3. **Barton LV.** 1985**. Seed Preservation and Longevity .** International Books and Periodicals Supply Service, New Delhi.
4. **Hall CW.** 1966**. Drying of Farms Crops .** Lyall Book Depot.
5. **Justice OL & Bass LN.** 1978**. Principles and Practices of Seed Storage** Castle House Publ.
6. **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.
7. **Sahay KM & Singh K K.** 1991**. Unit Operations in Food Engineering.** Vikas Publ.
8. **Virdi SS & Gregg BG.** 1970**. Principles of Seed Processing** . National Seed Corp., New Delhi

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

Skill Enhancement Course

Course Code – SSTLVC1251

Title of the Course: Seed Quality Testing

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

Coursepre-requisite:

1. Basic knowledge of seed biology, seed structure, and quality parameters.
2. Understanding of genetic purity, seed certification, and varietal identification.
3. Knowledge of seed-borne pathogens, microbial contamination, and their effects on seed quality.

Course objectives:

1. To educate students on seed quality parameters such as germination, vigor, moisture content, purity, and seed health.
2. To introduce various seed testing methods and laboratory techniques for evaluating seed quality.
3. To develop practical skills in seed sampling, testing procedures, and data interpretation for seed certification and commercial seed production

Course outcomes:

1. Understanding of Seed Quality Standards – Students will learn about national and international seed quality standards and their role in ensuring high-quality seeds.
2. Application of Seed Testing Techniques – Ability to conduct germination tests, purity tests, moisture analysis, and vigor assessments in seed laboratories.
3. Practical Skills in Seed Certification & Quality Control – Hands-on experience in seed testing, disease detection, and evaluation of seed performance for certification and commercial use.

CURRICULUMDETAILS:SSTLVC 1251: Seed Quality Testing

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Structure of monocot of important plant species with examples	4
2.	Structure of dicot seeds of important plant species, with examples	4
3.	Identification and handling of instruments used in seed testing laboratory	4
4.	Identification of seeds of weeds and crops; physical purity analysis of samples of different crops	4
5.	Estimation of seed moisture content (oven method)	4
6.	Seed dormancy breaking methods	4
7.	Requirements for conducting germination test, specifications and proper use of different substrata for germination;	4
8.	Seed germination testing in different agri-horticultural crops; seedling evaluation	4

9.	Viability testing by tetrazolium test in different crops	4
10.	Seed and seedling vigour tests applicable in various crops; species	4
11.	Cultivar identification; genetic purity testing by chemical and biochemical	4
12.	Cultivar identification; genetic purity testing by molecular methods	4
13.	Seed health testing for designated diseases: blotter methods,	4
14	Seed health testing for designated diseases: agar method and embryo count methods	4
15	Testing coated/pelleted seeds.	4
	Total	**60**

Text Books and Reference Books:

Text Books:

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

Reference Books:

1. **Agarwal, P.K. and Dadlani, M.** 1986. **Techniques in Seed Science and Technology**. South Asian Publishers, New Delhi.
2. **Agarwal RL.** 1997**. Seed Technology .** Oxford & IBH.
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.