॥ 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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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण–२०२० नुसार पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६–२७ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २२ एप्रिल २०२६ रोजी संपन्न झालेल्या मा.विद्यापरिषद बैठकीतील विषय क्र.०८/६४–२०२६ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसार पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६–२७ पासून लागू करण्यास मा.विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी.एस्सी. तृतीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६–२७ पासून लागू करण्यात येत आहे.

01	B.Sc. III Year Botany	10	B.Sc. III Year Biochemistry
02	B.Sc. III Year Chemistry	11	B.Sc. III Year Agriculture Microbiology
03	B.Sc. III Year Mathematics	12	B.Sc. III Year Electronics
04	B.Sc. III Year Zoology	13	B.Sc. III Year Seed Technology
05	B.Sc. III Year Microbiology	14	B.Sc. III Year Horticulture
06	B.Sc. III Year Geology	15	B.Sc. III Year Analytical Chemistry
07	B.Sc. III Year Enviornment & Earth Science	16	B.Sc. III Year Agrochemical & Fertilizers
08	B.Sc. III Year Statistics	17	B.Sc. III Year Industrial Chemistry
09	B.Sc. III Year Dairy Science	18	B.Sc. III Year Industrial 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/परिपत्रक/पदवी/बीएस्सी/२०२६–२७/60
दिनांक : १९.०६.२०२६

सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळे) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :–
१) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. प्र.कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ
३) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परिक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.

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

UNDERGRADUATE PROGRAMME OF

SCIENCE & TECHNOLOGY

B.Sc. Third Year

AGROCHEMICALS & FERTILIZERS

Effective from the Academic year 2026-2027

(As per NEP-2020)

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

UNDERGRADUATE PROGRAMME

Subject: Agrochemicals and Fertilizers

Objectives of the Program:

1. To provide fundamental knowledge of different types of agrochemicals and fertilizers used in agriculture.
2. To understand the role of agrochemicals in improving crop productivity and soil fertility.
3. To study the chemical nature, composition, and classification of fertilizers and pesticides.
4. To develop skills in the safe and effective application of agrochemicals for sustainable crop production.
5. To understand the environmental impacts and health hazards associated with excessive agrochemical use.
6. To promote integrated nutrient and pest management practices for sustainable agriculture.
7. To create awareness about regulatory guidelines and safe handling practices of agrochemicals.
8. To encourage the use of eco-friendly and organic alternatives to chemical inputs.

Program Outcomes (POs):

1. Apply fundamental knowledge of agrochemicals and fertilizers in crop production systems.
2. Analyze soil and crop nutrient requirements for efficient fertilizer management.
3. Select and use appropriate fertilizers and plant protection chemicals for different crops.
4. Demonstrate safe handling, storage, and application of agrochemicals.
5. Evaluate the environmental and health impacts of agrochemical use and suggest mitigation measures.
6. Implement sustainable practices such as Integrated Nutrient Management (INM) and Integrated Pest Management (IPM).
7. Utilize modern tools and techniques for precision nutrient and pesticide application.
8. Develop awareness of regulatory frameworks and ethical practices in agrochemical usage.

Program Specific Outcomes (PSOs):

1. Identify and classify major agrochemicals, including fertilizers, pesticides, herbicides, and biofertilizers used in agriculture.
2. Apply appropriate fertilizer and agrochemical combinations based on crop type, soil condition, and nutrient requirement.
3. Prepare and implement nutrient management plans for sustainable crop production.
4. Demonstrate practical skills in dosage calculation, mixing, and application techniques of agrochemicals.
5. Diagnose nutrient deficiencies and recommend suitable corrective measures using fertilizers and amendments.
6. Integrate organic and inorganic nutrient sources to maintain soil health and productivity.
7. Follow safety protocols and environmental regulations in the handling and use of agrochemicals.
8. Evaluate field performance of agrochemicals and suggest improvements for better efficiency and sustainability.

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Credit Framework for B.Sc. III Year

Multidisciplinary Degree Program with Multiple Entry and Exit

Subject: AGROCHEMICALS & FERTILIZERS (Major)

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)	Field Project/ Case Study/ OJT/	Credits	Total Credits
1	2	3		4	5	6	7	8	9	10	11
3 (5.5)	V	SAGFCT1301 (3cr) SAGFCT1302 (3cr) SAGFIKS1303(2cr) SAGFCP1301 (2cr) SAGFCP1302 (2cr) 12 Credits	Major Elective SAGFET1301 (2cr) SAGFEP1301 (2cr) 04 Credits	--	--	--	SAGFVC1301 02 Credits	--	FP/CS SAGFFP1301 Or SAGFCP1301 04 Credits	22	
	VI	SAGFCT1351 (3cr) SAGFCT1352 (3cr) SAGFCT1353 (2cr) SAGFCP1351 (2cr) SAGFCP1352 (2cr) 12 Credits	Major Elective SAGFET1351 (2cr) SAGFEP1351 (2cr) 04 Credits	--	--	--	SAGFVC1351 02 Credits	--	OJT SAGFOJT1351 04 Credits	22	
	Cum. Cr.	56		12	08	08	6+8=14	22	4+8=12		132
Exit option: B.Sc. with Major in Agrochemicals and Fertilizers and Minor DSM											

B. Sc. Third Year Semester V *(Level 5.5)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs./week)	
			Theory	Practical	Total	Theory	Practical
Major	SAGFCT1301	Agronomy and Seed Technology	03	--	12	03	--
	SAGFCP1301	Practical based on SAGFCT1301	--	02		--	04
	SAGFCT1302	Production technology of *Kharif* crops	03	--		03	--
	SAGFCP1302	Practical based on SAGFCT1302	--	02		--	04
	SAGFIKS1303	Subject Specific IKS	02	--		02	--
Elective	SAGFET1301	Fundamentals of Horticulture	02	--	04	02	--
	SAGFEP1301	Practical Based on SAGFET1301	--	02		--	04
	SAGFET1301	Commercial Seed Production	02	--		02	--
	SAGFEP1301	Practical Based on SAGFET 1301	--	02		--	04
Vocational Course	SAGFVC1301	Plant Propagation Techniques	--	02	02	--	04
Field Project/ Case Study/ OJT	SAGFFP1301	Field Project	--	04	04	--	08
		Total Credits	**10**	**12**	**22**	**10**	**24**

B. Sc. Third Year Semester V *(Level 5.5)*

Examination Scheme

[40% Continuous Assessment (*CA*) and 60% End Semester Assessment (*ESA*)]

Subject (1)	Course Code (2)	Course Name (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	SAGFCT1301	Agronomy and Seed Technology	30	30	30	45	--	--	75
	SAGFCP1301	Practical based on SAGFCT1301	--	--	--	--	20	30	50
	SAGFCT1302	Production technology of *Kharif* crops	30	30	30	45	--	--	75
	SAGFCP1302	Practical based on SAGFCT1302	--	--	--	--	20	30	50
	SAGFIKS1303	Subject Specific IKS	20	20	20	30	20	30	50
Elective	SAGFET1301	Fundamentals of Horticulture	20	20	30	20	20	30	50
	SAGFEP1301	Practical Based on SAGFET1301	--	--	--	--	20	30	50
	SAGFET1301	Commercial Seed Production	20	20	30	20	20	30	50
	SAGFEP1301	Practical Based on SAGFET 1301	--	--	--	--	20	30	50
Vocational Course	SAGFVC1301	Plant Propagation Techniques	--	--	--	--	20	30	50
Field Project/ Case Study/ OJT	SAGFFP1301	Field Project	--	--	--	--	40	60	100

B. Sc. Third Year Semester VI *(Level 5.5)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SAGFCT1351	Basics of Plant Biotechnology	03	--	12	03	--
	SAGFCP1351	Practical Based on SAGFCT 1351	--	02		--	04
	SAGFCT1352	Production technology of *Rabi* crops	03	--		03	--
	SAGFCP1352	Practical Based on SAGFCT 1352	--	02		--	04
	SAGFCT1353	Advances in Agricultural Technology	02	--		02	--
Elective	SAGFET1351	Natural Farming	02	--	04	02	--
	SAGFEP1351	Practical Based on SAGFET 1351	--	02		--	04
	SAGF1351	Agri-Business Management	02	--		02	--
	SAGFEP1351	Practical Based on SAGFET 1351	--	02		--	04
Vocational Course	SAGFVC1351	Preservation of Fruits and Vegetables	--	02	02	--	04
Field Project/ Case Study/ OJT	SAGFOJ1351	On Job Training (OJT)	--	04	04	--	08
		Total Credits	**10**	**12**	**22**	**10**	**24**

B. Sc. Third Year Semester VI *(Level 5.5)*

Examination Scheme

[40% Continuous Assessment (***CA***) and 60% End Semester Assessment (***ESA***)]

Subject (1)	Course Code (2)	Course Name (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	SAGFCT1351	Basics of Plant Biotechnology	30	30	30	45	--	--	75
	SAGFCP1351	Practical Based on SAGFCT 1351	--	--	--	--	20	30	50
	SAGFCT1352	Production technology of *Rabi* crops	30	30	30	45	--	--	75
	SAGFCP1352	Practical Based on SAGFCT 1352	--	--	--	--	20	30	50
	SAGFCT1353	Advances in Agricultural Technology	20	20	20	30	20	30	50
Elective	SAGFET1351	Natural Farming	20	20	30	20	20	30	50
	SAGFEP1351	Practical Based on SAGFET 1351	--	--	--	--	20	30	50
	SAGFET1351	Agri-Business Management	20	20	30	20	20	30	50
	SAGFEP1351	Practical Based on SAGFET 1351	--	--	--	--	20	30	50
Vocational Course	SAGFVC1351	Preservation of Fruits and Vegetables	--	--	--	--	20	30	50
Field Project/ Case Study/ OJT	SAGFOJ1351	On Job Training (OJT)	--	--	--	--	40	60	100

Syllabus for B. Sc. Agrochemicals and Fertilizers

Third Year

Semester – V

As Per National Education Policy- 2020

To be implemented from

Academic Year 2026-2027

National Education Policy 2020

B.Sc. Agrochemicals and Fertilizers, III Year (Semester - V)

Major Core Theory Course

Course Code – SAGFCT1301

Title of the Course: Agronomy and Seed Technology

[No. of Credits: 3 Credit] [Total: 45 Hours]

Course pre-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 Agrochemistry at undergraduate first and second year level, for entry level core courses in Agrochemicals and Fertilizers as major subject.
2. The students should have basic understanding of agriculture, plant science, soil science, and elementary genetics.

Course Objectives:

1. **[Knowledge-based]**
   To understand fundamental concepts of agronomy and seed technology, including crop production principles, seed structure, and factors affecting growth and productivity.
2. **[Skill-based]**
   To develop practical skills in crop management practices such as sowing, irrigation, nutrient management, seed processing, and seed testing techniques.
3. **[Application-based]**
   To apply agronomic practices and seed technology methods for improving crop yield, maintaining seed quality, and ensuring sustainable agricultural production.
4. **[Research-oriented]**
   To enhance analytical and research abilities in evaluating crop performance, seed quality, and adopting innovative techniques for agricultural advancement.

Course Outcomes (COs):

CO No.	Upon completion of this course, students will be able to:	Bloom's Level	PO Mapped
CO1	Explain the fundamental principles of agronomy and seed technology, including crop growth, development, and seed structure.	Remember/Understand	PO1, PO2
CO2	Apply agronomic practices and analyze factors affecting crop production such as soil, climate, and seed quality	Apply/Analyze	PO3, PO4
CO3	Evaluate seed quality parameters and develop improved strategies for seed production, processing, and storage	Evaluate/Create	PO5
CO4	Apply modern techniques and design sustainable solutions for crop management and seed technology practices	Apply/Create	PO6, PO7

Curriculum Details: SAGFCT1301- Agronomy and Seed Technology

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction to Agronomy**	**12**
	1.1	Agronomy: Definition, scope, role of Agronomist and relationship of Agronomy with other sciences	
	1.2	Agro-Climatic Zones of Maharashtra and India	
	1.3	Tillage: Definition, objectives, types of tillage, tillage implements. Effect of tillage on soil and crop growth	
	1.4	Tilth: Definition, characteristics and ideal tilth, Modern concepts of tillage	
2.0		**Rainfed Agriculture and Watershed Management**	**11**
	2.1	Rainfed agriculture: Introduction, types and history	
	2.2	Problems of rainfed agriculture in India and management strategies	
	2.3	Soil and water conservation techniques, Water harvesting: Definition, importance, its techniques	
	2.4	Watershed Management: Concept, objectives, principles and Components	
3.0		**Farming System**	**12**
	3.1	Farming systems – Definition, scope, concept and objective of Farming Systems	
	3.2	Classification of Farming systems and factors affecting it	
	3.3	Cropping systems: Definition, cropping pattern, Multiple cropping systems and its classification, advantages and disadvantages	
	3.4	Integrated Farming System (IFS): Definition, objectives, characteristics, components and advantages of IFS.	
4.0		**Principles of Seed Technology**	**10**
	4.1	Seed and seed technology: Introduction, definition and importance	
	4.2	Seed quality: Definition, characters of good quality seed, types of seed germination and dormancy.	
	4.3	Different classes of seed, principles of seed production, benefits of quality seed.	
	4.4	Seed treatment: Importance, methods of application, methods of sowing, sowing implements.	
		Total	**45**

National Education Policy 2020

B.Sc. Agrochemicals and Fertilizers, III Year (Semester - V)

Major Core Practical Course

Course Code – SAGFCP1301

Title of the Course: Practical based on SAGFCT1301

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

Curriculum details: SAGFCP1301: Practical based on SAGFCT1301

Sr. No.	Practical Exercises	Hrs. Required to cover the contents
1.	Identification of different tillage implements	4
2.	Operational tillage viz., primary, secondary, inter-tillage, sowing, harvesting, harvesting implements, working with them	4
3.	Visit to the field to observe the package of practices for any field crop	4
4.	Study of agro climatic zones of Maharashtra	4
5.	Study of agro climatic zones of India	4
6.	Calculation of plant population and seed rate for different field crops	4
7.	Studies on cropping pattern of different rainfed areas in the country	4
8.	Studies on drought, its classification and effect on crop growth	4
9.	Studies on field demonstration on soil and moisture conservation measures	4
10.	Identification of seeds and crop plants at different growth stages	4
11.	Determination of purity and germination percentage of seed	4
12.	Study of viability test and practice of seed treatments in different field crops	4
13.	Delinting of cotton seeds	4
14.	Visit to seed processing plant	4
15.	Visit to various IFS models	4
	Total	**60**

Text Books and Reference Books:

1. Introduction to Agronomy –Soil and water management by Vaidhya and Sahasrabuddhe.
2. Principles of Agronomy by T. Yellamanda Reddy and G. H. Sankara Reddy.
3. Crop production and field experimentation by Vaidya, V.G., Sahasrabuddhe, K.R. and Khuspe, V.S., Continental Prakashan, Vijaynagar, Pune.
4. Principles of Agronomy by Reddy, S.R., Kalyani Publishers, Ludhiana, India.
5. Dry Farming Technology in India by P. Rangaswamy
6. Panda, S.C., 2006.Agronomy Agribios Publication, New Delhi.
7. Sustainable Development of Dryland Agriculture in India – R. P Singh
8. Dryland Technology – M.L. Jat, S.R. Bhakar, S.K. Shrma, A. K. K
9. Seed Technology – Ratanlal Agrawal, Oxford and IBH. Publishing Company, New Delhi.
10. Principles of Seed Technology-Phundan Singh, Kalyani Publication New Delhi.
11. Hand book of Agriculture –ICAR Publications
12. Crop production and Management by Y. B. Morachand
13. Modern technique of raising field crops by Chidda singh
14. Agronomy of field crop by S.R. Reddy
15. Dryland resources and Technology – Vol. 8 L.L Somani, K.W. Kaushal
16. Physiological Aspect of Dryland Farming – U.S Gupta

National Education Policy 2020

B.Sc. Agrochemicals and Fertilizers, III Year (Semester - V)

Major Core Theory Course

Course Code – SAGFCT1302

Title of the Course: PRODUCTION TECHNOLOGY OF *KHARIF* CROPS

[No. of Credits: 3 Credit] [Total: 45 Hours]

Course pre-requisite:

1. The course is offered for a student registered for undergraduate third year programme in the faculty of science and technology who had primary training in the field of Agrochemistry at undergraduate first and second year level, for entry level core courses in Agrochemicals and Fertilizers as major subject.
2. Students should have basic knowledge of agronomy, soil science, and agricultural meteorology to understand crop growth, soil–crop interactions, and monsoon-based farming systems. They should also be familiar with plant physiology, crop identification, and basic pest and nutrient management practices for effective cultivation of Kharif crops

Course objectives:

1. **[Knowledge-based]**
   To develop understanding of principles and practices of Kharif crop production, including climate, soil, and crop characteristics.
2. **[Skill-based]**
   To equip students with practical skills in field preparation, sowing, nutrient management, irrigation, and pest control for Kharif crops.
3. **[Application-based]**
   To enable application of scientific techniques for improving productivity and sustainability of major Kharif cropping systems.
4. **[Research-oriented]**
   To encourage analytical thinking and experimentation in crop production practices for enhancing yield and resource-use efficiency.

Course outcomes:

CO No.	Course Outcome	Bloom's Level	PO Mapping
CO1	Explain principles and practices of Kharif crop production, including soil, climate, and crop requirements.	L2 (Understand)	PO1, PO2
CO2	Demonstrate skills in field preparation, sowing, nutrient management, irrigation, and pest control for major Kharif crops.	L3 (Apply)	PO3, PO4
CO3	Analyze crop production problems and recommend suitable management practices for improving productivity and sustainability.	L4 (Analyze)	PO2, PO5
CO4	Evaluate different cropping systems and technologies for efficient resource use and higher yield in Kharif crops.	L5 (Evaluate)	PO4, PO6
CO5	Design and conduct simple experiments or field trials related to Kharif crop production.	L6 (Create)	PO4, PO7

Curriculum Details: SAGFET1301: Production Technology of *Kharif* crops

Module No.	Unit No.	Topic *(Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices, Seeds and Sowing,Irrigation and Nutrient Management Intercultural operation, pest and disease management, Harvesting and yield of following Kharif crops)*	Hrs.
1.0		**Cereals**	**12**
	1.1	Rice	
	1.2	Maize	
	1.3	*Kharif* Sorghum	
	1.4	Pearl millet, Finger millet and other Minor millets	
2.0		**Pulses**	**11**
	2.1	Pigeon pea	
	2.2	Mungbean, Uradbean	
	2.3	Cowpea, Kidney bean	
	2.4	Horse gram	
3.0		**Oil seeds**	**10**
	3.1	Groundnut	
	3.2	Sesame	
	3.3	Soybean	
	3.4	Niger	
4.0		**Fiber, Forage crops and Grasses**	**12**
	4.1	Cotton	
	4.2	Jute	
	4.3	Forage crops –Sorghum, Cowpea, Pearl millet and Maize	
	4.4	Grasses: Napier and Marvel	
		Total	45

National Education Policy 2020

B.Sc. Agrochemicals and Fertilizers, III Year (Semester - V)

Major Core Practical Course

Course Code – SAGFCP1302

Title of the Course: Practical Based on SAGFCT1302

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

Curriculum details: SAGFCP1302: Practical Based on SAGFCT1302

Sr. No.	Practical Exercises	Hrs. Required to cover the contents
1 - 3	To study the tillage, sowing and transplanting operations in major *Kharif* crops, like: Soybean, Pigeonpea, Mungbean, Maize, Groundnut, Cotton (Sowing) and Forage crops	4
4	To study the effect of seed size on germination of *Kharif* crops	4
5	To study effect of sowing depth on germination of *Kharif* crops	4
6.	Calculations of plant population, seed rate and fertilizers doses	4
7.	Identification of weeds in *Kharif* crops	4
8 - 9	Top dressing and foliar feeding of nutrients	4
10 - 11	Study of yield contributing characters and yield calculation of *Kharif* crops	4
12.	Study of *Kharif* crop varieties	4
13.	Study of agro-morphological description of *Kharif* season crops	4
14.	Harvesting and threshing of cereals, pulses, oilseeds and cash *Kharif* crops	4
15.	Mechanization in *Kharif* crop cultivation	4
16.	Visit to Research Centers of related crop(s) and Study of important Agronomic Experiments at Agronomy Instructional Farm	4
	Total	**60**

Text Books and Reference Books:

1. B. Gurarajan, R. Balasubramanian and V. Swaminathan. Recent Strategies on Crop Production. Kalyani Publishers, New Delhi.

2. Chidda Singh.1997. Modern Techniques of Raising Field Crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

3. Rajendra Prasad. Textbook of Field Crops Production - Commercial Crops. Volume-II, ICAR Publication.

4. S.R. Reddy. 2009. Agronomy of Field Crops. Kalyani Publishers, New Delhi.

5. S.S. Singh. 2005. Crop Management. Kalyani Publishers, New Delhi.

6. UAS, Bangalore. 2011. Package of Practice. UAS, Bangalore.

7. Subhash Chandra Bose, M. and Balakrishnan, V. 2001. Forage Production South Asian Publishers, New Delhi.

National Education Policy 2020

B.Sc. Agrochemicals and Fertilizers, III Year (Semester -V)

Major Core Theory Course

Course Code – SAGFIK1303

Title of the Course: SUBJECT RELATED IKS

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

Name of the Programme	B.Sc. Third Year (Chemistry)
Title of the Course	Indian Knowledge System in Chemistry (SCHEIKS1301)
Year of Implementation	Academic Year 2026–27
Semester	V
Paper Type	IKS (Indian Knowledge System)
Credits	(Theory: 2)
Total Hours	30 Hours (Theory)
Formative Assessment	20 Marks (Internal Assessment)
Summative Assessment	30 Marks (Semester End Examination)
Total Marks	50 Marks

Course Objectives (CO)

1. To introduce students to the rich chemical heritage of India from prehistoric to ancient periods.
2. To develop an understanding of Indian philosophical concepts of matter and atomic theories.
3. To explore the applications of chemistry in ancient Indian medicine, textiles, metallurgy, and daily life.
4. To examine traditional chemical techniques such as distillation, calcination, and fermentation from a modern scientific perspective.

Course Outcomes (COs)

CO No.	Course Outcome Statement	Bloom's Level	PO Mapping
CO1	Explain early chemical traditions and material advancements from prehistoric to Harappan India.	Understand	PO1, PO3, PO9
CO2	Analyze Vedic and philosophical concepts of matter, including Vaisheshika and Jain atomic theories.	Analyze	PO2, PO3, PO10
CO3	Evaluate applications of chemical knowledge in ancient Indian medicine, textiles, and household materials.	Evaluate	PO6, PO8, PO12
CO4	Apply knowledge of ancient chemical techniques such as metallurgy, distillation, sublimation, and fermentation.	Apply	PO4, PO5, PO7, PO11

Detailed Syllabus (Four Modules – 30 Hours)

Module No.	Unit Title	Topics	Hours
I	**Early Chemical Traditions – Prehistoric to Harappan India**	• Pre-Harappan developments: early settlements, pottery techniques, coloured ceramics, copper extraction and fabrication. • Harappan advancements: ceramic technology, faience, pigments (ferric oxide, manganese oxide), glazed pottery, construction materials (gypsum, lime, sand). • Metals and minerals: copper, bronze alloys, gold, silver, semi-precious stones, galena, natural dyes (madder). • Post-Harappan phase: cultural transition and spread of metallurgical practices.	07
II	**Vedic Knowledge and Philosophical Concepts of Matter**	• Chemical knowledge in Vedic texts: metals, alloys, fermentation (soma, sura), natural dyes, medicinal plant use. • Atomic theories: Vaisheshika (Kanada) – paramanu, atomic combinations, molecular structures; Jain theory – atomic forces and chemical affinity. • Samkhya and Nyaya perspectives: evolution of matter, tanmatras, sensory properties, concept of akasha.	07
III	**Applications of Chemistry in Ancient India**	• Medicine (Ayurveda): Rasashastra, herbal and mineral-based preparations. • Textiles: natural dyes (indigo, madder, turmeric), mordants, dyeing techniques. • Tools and weapons: metal crafting and hardening techniques. • Ceramics and household materials: glazed pottery, terracotta, soaps, oils, and cosmetics. • Construction materials: gypsum, lime, and sand-based binders and plasters.	08
IV	**Ancient Chemical Techniques and Processes**	• Metallurgy (धातुकर्म): extraction, purification, and alloy formation (brass, bronze, wootz steel). • Distillation (आसवन प्रक्रिया): preparation of perfumes, essential oils, and medicines. • Other techniques: sublimation (उर्ध्वपातन), calcination, and fermentation processes in beverages and medicinal formulations.	08
		Total	30

Recommended Textbooks:

1. Pakrashi, B. C., & Ghosh, S. (Eds.). *History of Science in India, Vol. III: Chemical Sciences*. The National Academy of Sciences, India (NASI) & Ramakrishna Mission Institute of Culture, Kolkata.
2. S. Mahdihassan, *Indian Alchemy: Its Origin and Ramifications*, Motilal Banarsidass, 1991.
3. B. V. Subbarayappa, *Chemistry in Ancient and Medieval India*, INSA, 1999.
4. P. C. Ray, *History of Chemistry in Ancient and Medieval India*, Indian Chemical Society, 1956.
5. O. P. Jaggi, *History of Science and Technology in India (Vol. 1–12)*, Atma Ram & Sons, 1970.
6. Debiprasad Chattopadhyaya, *History of Science and Technology in Ancient India*, Firma KLM, 1986.

E-Resources / MOOCs

1. NPTEL: Indian Knowledge System – IIT Kharagpur (https://nptel.ac.in)
2. SWAYAM: History of Science and Technology in India – UGC
3. INSA Digital Repository (https://insa.nic.in) – Resources on Indian Chemistry

National Education Policy 2020

B.Sc. Agrochemicals and Fertilizers, III Year (Semester -V)

Major Elective Theory Course

Course Code – SAGFET1301

Title of the Course: FUNDAMENTALS OF HORTICULTURE

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

Course pre-requisite:

1. The course is offered for a student registered for undergraduate third year programme in the faculty of science and technology who had primary training in the field of Agrochemistry at undergraduate first and second year level, for entry level core courses in Agrochemicals and Fertilizers as major subject.
2. Students should possess a fundamental knowledge of horticultural crops, various agricultural practices, propagation techniques, and basics of plant breeding.

Course objectives:

1. **[Knowledge-based]**
   To understand the fundamental concepts of horticulture, including the production and management of fruits, vegetables, and ornamental crops, and factors affecting their growth and productivity.
2. **[Skill-based]**
   To develop practical skills in nursery management, propagation techniques, crop management practices, and processing of fruits and vegetables into value-added products.
3. **[Application-based]**
   To apply horticultural practices and fruit processing techniques for quality production, preservation, and value addition, ensuring improved shelf life and market value.
4. **[Research-oriented]**
   To enhance analytical and research abilities in evaluating crop performance, quality of produce, and development of improved processing and preservation techniques.

Course outcomes:

CO No.	Upon completion of this course, students will be able to:	Bloom's Level	PO Mapped
CO1	Explain the basic concepts, branches, and importance of horticulture in agriculture and economy.	Remember / Understand	PO1, PO2
CO2	Apply various plant propagation techniques and nursery management practices for horticultural crops.	Apply	PO3
CO3	Analyze the growth, development, and cultivation requirements of fruits, vegetables, and ornamental plants under different conditions.	Analyze	PO4
CO4	Evaluate pest, disease, and nutrient management strategies to improve yield and quality of horticultural crops.	Evaluate	PO5
CO5	Develop sustainable horticultural practices including organic farming, protected cultivation, and efficient resource management.	Create	PO6, PO7
CO6	Demonstrate post-harvest handling, storage, processing, and marketing techniques for horticultural produce.	Apply / Create	PO3, PO6

Curriculum details: SAGFET1301: FUNDAMENTALS OF HORTICULTURE

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction to Horticulture**	**7**
	1.1	Horticulture, its definition, branches of horticulture, Importance and scope of horticulture in India.	
	1.2	Propagation of horticulture crops, its definition, types of propagation, propagation by seeds.	
	1.3	Methods of vegetative propagation, cuttings, budding, grafting, layering.	
	1.4	Micropropagation, its definition, method, advantages and disadvantages.	
2.0		**Nursery management and protected cultivation**	**7**
	2.1	Nursery, its definition, types of nursery and nursery beds.	
	2.2	Preparation of the nursery bed, sunken, level and raised bed.	
	2.3	Container for propagation and growing young plants.	
	2.4	Protected cultivation, types, component and advantages.	
3.0		**Olericulture**	**8**
	3.1	Olericulture, its definition, scope and importance of vegetable growing.	
	3.2	Classification of vegetable.	
	3.3	Types of vegetable garden-truck, market and kitchen garden.	
	3.4	Post harvest technology of vegetables, processing and storage.	
4.0		**Package of practices for important fruit and vegetable crops**	**8**
	4.1	Banana	
	4.2	Mango	
	4.3	Tomato	
	4.4	Chilli	
		Total	**30**

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester -V)

Major Elective Practical Course

Course Code – SAGFEP1301

Title of the Course: Practical Based on SAGFET1301

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

Curriculum details: SAGFEP 1301: Practical Based on SAGFET1301

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	Identification of garden tools	4
2-3	Identification and Nomenclature of fruits	4
4	Layout of an orchard	4
5	Pit making and system of planting	4
6	Nursery raising techniques of fruit crops	4
7	Understanding of plant propagation structures	4
8	Propagation through seeds and plant parts	4
9	Propagation techniques for horticultural crops	4
10	Container, potting mixture, potting and repotting	4
11	Training and pruning methods on fruit crops	4
12	Preparation of fertilizer mixture and application	4
13	Preparation and application of PGR	4
14	Layout of different irrigation systems	4
15	Visits to commercial nurseries	4
	Total	**60**

Text Books and Reference Books:

1. Handbook of Horticulture. Chadha, K.L. (2004). ICAR, New Delhi.
2. Introductory Horticulture. Kumar, N. Rajalakshmi Publications, Nagercoil.
3. Fundamentals of Horticulture. Singh, J. Kalyani Publishers, Ludhiana.
4. Horticulture: Principles and Practices. Peter, K.V. and Pradeepkumar, T. New India Publishing Agency, New Delhi.
5. Modern Horticulture. Choudhary, B. National Book Trust, New Delhi.
6. Fruit Science: Orchard and Plantation Crops. Chadha, K.L. ICAR, New Delhi.
7. Production Technology of Fruit Crops. Bose, T.K., Mitra, S.K. and Sanyal, D. Naya Udyog, Kolkata.
8. Fundamentals of Vegetable Production. Kalloo, G. ICAR, New Delhi.
9. Advances in Vegetable Science. Kalloo, G. and Bergh, B.O. ICAR, New Delhi.
10. Principles of Vegetable Production. Singh, S.P. Kalyani Publishers, Ludhiana.
11. Textbook of Vegetable Crops. Singh, D.K. ICAR, New Delhi.
12. Vegetable Production and Practices. Singh, J. and Singh, J.P. Kalyani Publishers, Ludhiana.

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester -V)

Major Elective Theory Course

Course Code – SAGFET1301

Title of the Course: COMMERCIAL SEED PRODUCTION

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

Course pre-requisite:

1. Students should have a basic understanding of crop production, plant breeding principles, and seed science.
2. Knowledge of agronomy, plant propagation, and crop varieties will help in better understanding of seed production techniques, certification standards, and quality assurance procedures in commercial seed production systems.

Course objectives:

1. To provide knowledge about the importance, scope, and principles of commercial seed production in agriculture.
2. To understand the seed production systems, classes of seed, and seed certification standards.
3. To impart skills in field operations for seed production including isolation, rouging, harvesting, and processing.
4. To familiarize students with seed quality control, seed testing, storage, and seed health management.
5. To develop entrepreneurial and managerial abilities for establishing and managing commercial seed production enterprises.

Course outcomes:

1. **CO1:** Explain the principles, scope, and importance of commercial seed production in agriculture. *(Understanding)*
2. **CO2:** Describe seed classes, seed production systems, and certification standards. *(Understanding)*
3. **CO3:** Apply field techniques such as isolation, rouging, harvesting, and processing in seed production. *(Applying)*
4. **CO4:** Analyze seed quality control, seed testing, storage, and seed health management practices. *(Analyzing)*
5. **CO5:** Develop plans for commercial seed production enterprises ensuring quality and profitability. *(Creating)*

Curriculum details: SAGFET1301: COMMERCIAL SEED PRODUCTION

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**General Principles of Seed Production**	**8**
	1.1	Introduction to Seed Production System	
	1.2	Site Selection and Agronomic Requirements	
	1.3	Hybrid Seed Production in Field Crops	
	1.4	Seed Production in Horticultural Crops and Genetic Concepts	
2.0		**General Principles of Seed Processing**	**7**
	2.1	Introduction to Seed Processing	
	2.2	Seed Drying Principles and Method	
	2.3	Cleaning and Grading of Seeds	
	2.4	Seed Treatment, Bagging and Labelling	
3.0		**General Principles of Seed Testing**	**8**
	3.1	Introduction to Seed Testing and Sampling	
	3.2	Components of Seed Quality Testing.	
	3.3	Seed Viability, Vigour, Germination and Dormancy.	
	3.4	Seed Certification and Standards	
4.0		**Seed Industry and Seed Marketing**	**7**
	4.1	Introduction to Seed Industry Development	
	4.2	Seed Marketing Concepts and Systems	
	4.3	Seed Economics and Market Dynamics	
	4.4	Biotechnology in Seed Technology	
		Total	**30**

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester -V)

Major Elective Practical Course

Course Code – SAGFEP1301

Title of the Course: Practical Based on SAGFET1301

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

Curriculum details: SAGFEP1301: Practical Based on SAGFET1301

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	To study the working of mechanical seed drying equipment.	4
2	To observe how drying affects seed germination.	4
3	To identify different seed cleaning and grading machines.	4
4	To study seed treating equipment used in seed processing	4
5	To understand basic field layout in seed production	4
6	To learn planting ratio of male and female lines.	4
7	To understand the importance of isolation distance.	4
8	To observe detasseling process in maize hybrid seed production.	4
9	To identify and remove unwanted plants (rogues).	4
10	To observe basic method of pollen collection.	4
11	To observe stigma condition for pollination.	4
12	To identify common storage fungi in seeds.	4
13	To observe basic seed treatment methods.	4
14	To observe seed processing activities in a seed plant.	4
15	To study storage and packaging of seeds in seed stores.	4
	Total	**60**

Text Books and Reference Books:

1. Agarwal, R.L. 1997. Seed Technology. 2nd edn. Oxford & IBH.
2. McDonald, M.B. Jr and Copeland, L.O. 1997. Seed Production: Principles and Practices. Chapman & Hall
3. Thompson, J.R. 1979. An Introduction to Seed Technology. Leonard Hill.
4. Singhal, N.C. 2003. Hybrid Seed Production in Field Crops. Kalyani.
5. Justice, O.L. and Bass, L.N. 1978. Principles and Practices of Seed Storage. Castle House Publ. Ltd.
6. Tunwar, N.S. and Singh S.N. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry of Agriculture, New Delhi.
7. Chawla, H.S. 2008. Introduction to Plant Biotechnology. 2nd edn. Oxford &IBH publishing Co. Ltd. 113-B Shahpur Jat, New Delhi-110049.

National Education Policy 2020

B.Sc. Agrochemicals and Fertilizers, III Year (Semester -V)

Vocational Skill Course

Course Code – SAGFVC1301

Title of the Course: Plant Propagation Techniques

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

Course pre-requisite:

1. The course is offered for a student registered for undergraduate third year programme in the faculty of science and technology who had primary training in the field of Agrochemistry at undergraduate first and second year level, for entry level core courses in Agrochemicals and Fertilizers as major subject.
2. The students should have basic understanding of agriculture, plant science, soil science, and genetics.

Course Objectives:

1. **[Knowledge-based]**
   To understand the basic concepts of plant propagation, including its definition, scope, importance, and role in horticulture, agriculture, and forestry.
2. **[Skill-based]**
   To develop practical skills in various plant propagation techniques such as seed propagation, budding, grafting, layering, and cutting.
3. **[Application-based]**
   To apply appropriate propagation methods for large scale multiplication, production of disease-free planting material, and maintenance of genetic purity.
4. **[Research-oriented]**
   To enhance ability in evaluating propagation techniques, understanding genetic variation, and adopting modern practices for conservation and crop improvement.

Course Outcomes (COs):

1. **CO1:** Explain the principles, scope, and importance of plant propagation in horticulture and agriculture. *(Understanding)*
2. **CO2:** Identify and describe various sexual and asexual propagation methods used in plant multiplication. *(Understanding/Remembering)*
3. **CO3:** Demonstrate practical skills in seed propagation, cutting, layering, grafting, and budding techniques. *(Applying)*
4. **CO4:** Analyze factors affecting propagation success such as environment, hormones, and nursery management practices. *(Analyzing)*
5. **CO5:** Develop propagation strategies for quality plant production and conservation of rare and economically important species. *(Creating)*

Curriculum Details: SAGFVC1301- Plant Propagation Techniques

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Study of plant propagation methods (sexual method-seed)	4
2.	Optimum condition for seed germination	4
3.	Study on types of germination.	4
4.	Floral biology of sorghum, bajra and maize. (Any One)	4
5.	Floral biology of pigeon pea, green gram and black gram. (Any One)	4
6.	Studies on physical purity of seed	4
7.	Study on seed germination.	4
8.	Study on seed viability.	4
9.	Study on seed Vigour test.	4
10.	Study of plant propagation methods (asexual method)	4
11.	To study and practice of cutting techniques.	4
12.	To study and practice of budding techniques.	4
13.	To study and practice of grafting techniques.	4
14.	To study and practice of layering techniques.	4
15.	Visit to Nursery / Fruit Orchard / Ornamental Garden	4
	Total	**60**

Text Books and Reference Books:

1. Plant Propagation: Principles and Practices. Hudson T. Hartmann, Dale E. Kester, Fred T. Davies Jr., Robert L. Geneve. Pearson Education.
2. Introduction to Horticulture. N. Kumar. Rajalakshmi Publications.
3. Fundamentals of Horticulture. J.S. Bal. Kalyani Publishers.
4. Plant Propagation and Nursery Management. H.S. Chawla. Kalyani Publishers.
5. Plant Propagation. T.K. Bose, T.P. Mukherjee, S.K. Sadhu. Naya Prokash.
6. Horticulture at a Glance. Amar Singh. Kalyani Publishers.
7. Principles of Seed Science and Technology. A.K. Agrawal. Oxford & IBH Publishing.
8. Handbook of Horticulture. K.L. Chadha. Indian Council of Agricultural Research (ICAR).
9. Seed Science and Technology. S.M. Khurana. Daya Publishing House.

FIELD PROJECT (FP)

Course Description:

Field Project (FP) focuses on practical exposure to agricultural fields, Agro-processing units, Agrochemicals and fertilizers industries, Analytical laboratories where students study crop production practices, pest and disease management, fertilizer application, processing methods and production technologies under real conditions.

Objectives:

1. To provide field-level knowledge of crop production practices.
2. To study pest, disease, and nutrient management in crops.
3. To develop observation, data collection, and analytical skills.
4. To enhance problem-solving ability in real farming situations.

Learning Outcomes:

After completion of FP, students will be able to:

- Identify pests, diseases, and nutrient deficiencies in crops.
- Recommend appropriate management practices.
- Analyze field data and prepare reports.
- Apply theoretical knowledge in practical conditions.

Components of FP:

Sr. No.	Components	Details	Hours
1	**Field Visit**	Study of crops for pest, disease, and fertilizer management practices.	30
2	**Data Collection**	Recording observations on crop growth, inputs, and field conditions.	30
3	**Project Work**	Analysis and reporting of field data and findings.	30
4	**Project report**	A final report must be submitted at the end of training/project.	30

Semester – VI

B.Sc. III Year

Agrochemicals and Fertilizers

As Per National Education Policy- 2020

National Education Policy 2020

B.Sc. Agrochemicals and Fertilizers, III Year (Semester - VI)

Major Core Theory Course

Course Code – SAGFCT1351

Title of the Course: Basics of Plant Biotechnology

[No. of Credits: 3 Credit] [Total: 45 Hours]

Course pre-requisite:

1. The course is offered for a student registered for undergraduate third year programme in the faculty of science and technology who had primary training in the field of Agrochemistry at undergraduate first and second year level, for entry level core courses in Agrochemicals and Fertilizers as major subject.
2. The students should have basic understanding of agriculture, plant science, soil science, and elementary genetics.

Course Objectives:

1. **[Knowledge-based]**

To understand the fundamental concepts of plant biotechnology, including tissue culture, genetic engineering, molecular breeding, and their role in crop improvement and protection.

2. **[Skill-based]**

To develop practical skills in plant tissue culture techniques, micropropagation, and the use of basic biotechnological tools and methods.

3. **[Application-based]**

To apply biotechnological approaches such as GM crops, marker-assisted selection (MAS), PCR, and biopesticides for crop improvement and sustainable plant protection.

4. **[Research-oriented]**

To enhance the ability to analyse and evaluate recent advances in biotechnology such as CRISPR-Cas9 and transgenic technology for solving agricultural problems.

Course Outcomes (COs):

1. **CO1:** Explain the fundamental concepts, scope, and importance of plant biotechnology in agriculture. *(Understanding)*
2. **CO2:** Describe the principles of plant tissue culture, cell biology, and genetic engineering techniques. *(Understanding)*
3. **CO3:** Demonstrate basic laboratory skills in plant tissue culture techniques such as sterilization, media preparation, and explant culture. *(Applying)*
4. **CO4:** Analyze applications of biotechnology in crop improvement, disease resistance, and micropropagation. *(Analyzing)*
5. **CO5:** Evaluate the role of plant biotechnology in sustainable agriculture and future food security. *(Evaluating)*

Curriculum Details: SAGFCT1351- Basics of Plant Biotechnology

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Tissue Culture**	**12**
	1.1	Tissue Culture, definition, concept and principles of plant tissue culture.	
	1.2	Stages of micropropagation.	
	1.3	Types of culture: callus culture, meristem culture, protoplast, anther culture.	
	1.4	Applications: disease-free plants, rapid multiplication, germplasm conservation, advantages and limitations of tissue culture.	
2.0		**Biotechnology: recent techniques in plant protection**	**11**
	2.1	Biotechnology, definition, scope and importance of agricultural biotechnology.	
	2.2	Genetically Modified (GM) crops: concept, development and advantages.	
	2.3	Molecular breeding: marker assisted selection (MAS), definition and steps in marker assisted selection.	
	2.4	Role of biotechnology in crop protection.	
3.0		**Genetic Engineering**	**12**
	3.1	Genetic engineering, definition, concept, scope and importance.	
	3.2	Tools of genetic engineering.	
	3.3	PCR, principles and application.	
	3.4	Steps of recombinant DNA technology in plant protection.	
4.0		**Recent techniques in crop protection**	**10**
	4.1	B.T. Cotton, definition, introduction of Bt. gene and achievements in India.	
	4.2	Transgenic plant, definition, steps and their importance in crop improvement.	
	4.3	Biopesticides, definition, types and advantages.	
	4.4	CRISPR-Cas9 Technology.	
		Total	**45**

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester - VI)

Major Core Practical Course

Course Code – SAGFCP1351

Title of the Course: Practical Based on SAGFCT1351

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

Curriculum Details: SAGFCP1351- Practical Based on SAGFCT1351

Sr. No.	Practical Exercises	Hrs. Required to cover the contents
1	Preparation of solution, pH & buffers.	4
2	Preparation of stock solution.	4
3	Plant tissue culture laboratory specification.	4
4	Study on sterilization of instruments / media.	4
5	Study of laminar air flow.	4
6	Determination of zinc from zinc containing micronutrients / media.	4
7	Determination of manganese from manganese containing micronutrients / media.	4
8	Determination of pH from given media sample.	4
9	Preparation of tissue culture media.	4
10	Isolation of explant. (Sugarcane / Banana)	4
11	Prepare biopesticides (N*eem / Karanj / Lantana* extract)	4
12	Prepare neem seed kernel extract (NSKE)	4
13	Study of models on DNA.	4
14	Visit to hardening unit.	4
15	Visit to tissue culture laboratory.	4
	Total	**60**

Text Books and Reference Books:

1. Plant Tissue Culture: Theory and Practice. S.S. Bhojwani and M.K. Razdan. Elsevier Science Publication.
2. Plant Tissue Culture: Techniques and Experiments. Smith, R.H.
3. Plant Tissue Culture. Purohit, S.S.
4. Plant Tissue Culture. Reddy, Jayarama.
5. Biotechnology: Expanding Horizons. Singh, B.D.
6. Introduction to Plant Biotechnology. Chawla, H.S.
7. Plant Biotechnology: The Genetic Manipulation of Plants. Slater, A., Scott, N.W. & Fowler, M.R
8. Introduction to Plant Biotechnology. H.S. Chawla. Oxford & IBH Publishing Co. Pvt. Ltd.
9. Plant Biotechnology. B.D. Singh. Kalyani Publishers.
10. Biotechnology: Expanding Horizons. B.D. Singh. Kalyani Publishers.
11. Plant Tissue Culture. Kalyan Kumar De. New Central Book Agency.
12. Principles of Gene Manipulation and Genomics. S.B. Primrose and R.M. Twyman. Blackwell Publishing.
13. Molecular Biotechnology: Principles and Applications of Recombinant DNA. Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten. ASM Press.
14. Biopesticides and Bioagents. K. Sahayaraj. New India Publishing Agency.
15. Handbook of Plant Biotechnology. P.K. Gupta. Rastogi Publications.

Online Resources

1. ICAR e-Courses: https://ecoursesonline.iasri.res.in
2. FAO Biotechnology: https://www.fao.org/biotechnology
3. NCBI (Genetics & PCR): https://www.ncbi.nlm.nih.gov

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester - VI)

Major Core Theory Course

Course Code – SAGFCT1352

Title of the Course: PRODUCTION TECHNOLOGY OF *RABI* CROPS

[No. of Credits: 3 Credit] [Total: 45 Hours]

Course Prerequisite:

1. Students should have basic knowledge of agronomy, soil science, and crop production principles.
2. Understanding of climatic requirements, irrigation practices, nutrient management, and previous exposure to Kharif crop production will help in better comprehension of rabi crop cultivation practices and management techniques.

Course Objectives:

1. To provide knowledge about the importance, scope, and distribution of major rabi crops in India.
2. To understand agro-climatic requirements, soil conditions, and crop ecology of different rabi crops.
3. To impart skills in scientific crop production practices including land preparation, sowing, irrigation, and nutrient management.
4. To familiarize students with integrated pest, disease, and weed management practices in rabi crops.
5. To develop ability for efficient harvesting, post-harvest handling, and storage of rabi crops for improved productivity and profitability.

Course Outcomes (COs):

1. **CO1:** Explain the importance, scope, and distribution of major rabi crops in India. *(Understanding)*
2. **CO2:** Describe agro-climatic requirements, soil suitability, and growth stages of rabi crops. *(Understanding)*
3. **CO3:** Apply recommended agronomic practices such as land preparation, sowing, irrigation, and nutrient management for rabi crops. *(Applying)*
4. **CO4:** Analyze pest, disease, and weed problems in rabi crops and suggest suitable management strategies. *(Analyzing)*
5. **CO5:** Evaluate harvesting, storage, and post-harvest technologies to improve yield and quality of rabi crops. *(Evaluating)*

CURRICULUM DETAILS: SAGFET1351- PRODUCTION TECHNOLOGY OF *RABI* CROPS

Module No.	Unit No.	Topic *(Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices, Seeds and Sowing,Irrigation and Nutrient Management Intercultural operation, pest and disease management, Harvesting and yield of following Rabbi crops)*	Hrs. Required to cover the contents
1.0		**Cereals**	**12**
	1.1	Wheat	
	1.2	Barley	
	1.3	Rabi Sorghum	
	1.4	Maize (grain corn, sweet corn and baby corn)	
2.0		**Pulses**	**11**
	2.1	Chickpea	
	2.2	Lentil	
	2.3	Peas	
	2.4	French bean	
3.0		**Oilseeds**	**10**
	3.1	Sunflower	
	3.2	Safflower	
	3.3	Mustard	
	3.4	Linseed	
4.0		**Sugar, Medicinal and Forage crops**	**12**
	4.1	Sugar crop –Sugarcane and sugar beet	
	4.2	Medicinal and aromatic crops- Mentha, Lemon grass and Citronella	
	4.3	Forage crops –Lucerne, Berseem, Maize, Oat and Sorghum	
	4.4	Other crops –Potato, tobacco and sweet potato	
		Total	**45**

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester - VI)

Major Core Practical Course

Course Code – SAGFCP1352

Title of the Course: PRACTICAL BASED ON SAGFCT1352

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

Curriculum Details: SAGFCP1352- Practical Based on SAGFCT1352

Sr. No.	Practical Exercises	Hrs. Required to cover the contents
1.	Identification of major *Rabi* crops and their seeds	4
2.	Study of sowing methods of Wheat	4
3.	Study of planting method of Sugarcane.	4
4.	Demonstration of mechanization in crop cultivation practices in *rabi* crops	4
5-6	Identification of weeds and use of herbicides in rabi crops.	8
7.	Study of morphological characteristics of rabi crops.	4
8-9	Calculations of plant population, seed rate and fertilizers doses	8
10.	Study of yield contributing characters of rabi crops.	4
11.	Study of maturity signs and juice quality analysis of Sugarcane.	4
12-13	Study of important agronomic experiments of rabi crops at experimental	8
14.	Study of *rabi* forage experiments.	4
15.	Visit to Research Stations of related *rabi* crops	4
	Total	**60**

Text Books and Reference Books:

1. B. Gurarajan, R. Balasubramanian and V. Swaminathan. Recent Strategies on Crop Production. Kalyani Publishers, New Delhi.

2. Chidda Singh.1997. Modern Techniques of Raising Field Crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

3. Rajendra Prasad. Textbook of Field Crops Production - Commercial Crops. Volume II, ICAR Publication.

4. Rajendra Prasad. Textbook of Field Crops Production - Foodgrain Crops. Volume I, ICAR Publication.

5. S.R. Reddy. 2009. Agronomy of Field Crops. Kalyani Publishers, New Delhi.

6. S.S. Singh. 2005. Crop Management. Kalyani Publishers, New Delhi.

7. UAS, Bangalore. 2011. Package of Practices. UAS, Bangalore.

8. Rajendra Prasad. 2002. Text Book of Field Crops Production, ICAR, New Delhi.

9. S.R. Reddy. 2004. Agronomy of Field crops, Kalyani Publishers, Ludhiana.

10. Subhash Chandra Bose, M. and Balakrishnan, V. 2001. Forage Production, South Asian Publishers, New Delhi.

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester - VI)

Major Core Theory Course

Course Code – SAGFCT1353

Title of the Course: ADVANCES IN AGRICULTURE TECHNOLOGY

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

Course pre-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 Agrochemistry at undergraduate first and second year level, for entry level core courses in Agrochemicals and Fertilizers as major subject.
2. The students should have basic knowledge of agriculture.

Course objectives:

1. To introduce fundamental concepts of modern agricultural technology, including tools, machinery, and scientific advancements used in farming.
2. To develop understanding of precision agriculture techniques, such as GPS-based farming, remote sensing, and data-driven decision-making.
3. To provide knowledge of farm mechanization, including operation, maintenance, and selection of agricultural implements and equipment.
4. To familiarize students with irrigation technologies and water management systems, ensuring efficient and sustainable use of water resources.
5. To explore the role of biotechnology in agriculture, including genetically modified crops, tissue culture, and crop improvement techniques.
6. To understand post-harvest technology and food processing, focusing on storage, preservation, and value addition of agricultural produce.
7. To promote sustainable agricultural practices, including organic farming, integrated pest management (IPM), and conservation agriculture.
8. To enhance skills in the use of digital tools and smart farming technologies, such as IoT, drones, and agricultural software.
9. To develop problem-solving and decision-making abilities related to real-world agricultural challenges.
10. To prepare students for careers in agri-tech industries, research, and entrepreneurship.

Course outcomes:

CO No.	Course Outcome Statement	Bloom's Level
CO1	Explain the basic concepts of agricultural technology, tools, and modern farming systems.	Remember / Understand
CO2	Apply principles of farm mechanization and precision agriculture techniques in field conditions.	Apply
CO3	Analyze different irrigation methods and water management practices for efficient use of resources.	Analyze
CO4	Evaluate the role of biotechnology and modern techniques in crop improvement and protection.	Evaluate
CO5	Develop strategies for sustainable agriculture using eco-friendly and integrated approaches.	Create
CO6	Utilize digital and smart farming technologies (IoT, drones, sensors) for agricultural applications.	Apply / Analyze

Curriculum Details: SAGFCT1353- ADVANCES IN AGRICULTURE TECHNOLOGY

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Precision Farming**	**7**
	1.1	Precision agriculture: concepts and techniques	
	1.2	Components of precision farming: GPS, GIS, Remote sensing, Digital soil mapping	
	1.3	Their issues and concerns reference for Indian agriculture	
	1.4	Advanced Crop Science & Sustainability	
2.0		**Protected Cultivation & Soil-less Cultivation**	**8**
	2.1	Protected cultivation: introduction, history, origin, development, national and international scenario.	
	2.2	Green house technology- Types of green houses, components and design of greenhouses, advantages, applications in agriculture	
	2.3	Vertical farming definition, their scope and objectives; multilayer farming	
	2.4	Methods of soil-less cultivation, hydroponics, aeroponics- definition, requirements, advantages, disadvantages and opportunities and applications	
3.0		**Modern Irrigation Systems**	**8**
	3.1	Sprinkler irrigation: types of sprinkler irrigation systems; Design of sprinkler irrigation system, merits and demerits	
	3.2	Micro Irrigation systems: types- drip, spray, and bubbler systems, merits and demerits, different components; design of drip irrigation system	
	3.3	Smart irrigation: Introduction, components, features and advantages of smart irrigation system	
	3.4	Fertigation: concept, advantages and limitations of fertigation	
4.0		**Smart Farming Technologies**	**7**
	4.1	Internet of Things (IoT) in Agriculture	
	4.2	Artificial Intelligence (AI) & Machine Learning	
	4.3	Agricultural Robotics & Automation	
	4.4	Farm Management Software & Apps	
		Total	**30**

Text Books and Reference Books:

1.Data Analytics in Bioinformatics: A Machine Learning Perspective. Editor (s): Rabinarayan Satpathy, Tanupriya Choudhury, Suneeta Satpathy and Sachi Nandan.

2. Machine Learning Approaches to Bioinformatics by Zheng Rong Yang.

3. Text Book of Remote Sensing and Geographical Information Systems by M. Anji Reddy.

4. Precision Agriculture Technologies for Food Security and Sustainability By A El-Kader, M Sherine, M El-Basioni and M Basma.

5. Principles and Theory of Geoinformatics by P.K. Garg. Khanna Publishers. 296p

6. Advances in Geoinformatics Remote Sensing and GIS by Bhunia, Gouri Sankar, Uday Chatterjee and Gopal Krishna Panda. BIO GREEN

7. Artificial Intelligence: Machine Learning, Deep Learning, and Automation Processes by John Adamssen. Efalon Acies.

8. Sharma, P. 2007. Precision Farming. Daya Publishing House New Delhi.

9. Singh, B. and Singh, B. 2014. Advances in Protected Cultivation. New India Publishing Company.

10.Parvatha RP. 2016. Sustainable crop protection under protected cultivation. E-Book Springer.

11. Prasad S and Kumar U. 2005. Greenhouse management for horticultural crops. 2nd edn. A Grobios.

12. Hydroponics for Beginners and Advanced: The Ultimate Hydroponic and Aquaponic Gardening Guide by Tom Garden, Webb Eleanor.

13.Hi-tech Horticulture by T.A. More.

14. Mane, M. S. and Ayare, B. L. 2007. Principles of Sprinkler Irrigation system. Jain Brothers, New Delhi.

15. Mane, M. S. and Ayare, B. L. and Magar, S. S. 2006. Principles of Drip Irrigation systems. Jain Brothers, New Delhi.

16. Suresh, R. 2010. Micro Irrigation - Theory and Practices. Standard Publishers Distributors, Delhi.

17. IoT-Based Smart Irrigation System for Agriculture – V. Ramachandran

18. Craig John, J. 2005. Introduction to Robotics. Pearson Education Inc., Asia, 3rd Edition.

19. Ghoshal, Asitava. 2006. Robotics: Fundamental Concepts and Analysis. Oxford University Press.

20. Gonzalez and Wintz. Digital Image Processing. 3rd edn.

21. Nikku, S. B. 2020. Introduction to Robotics – Analysis, Control, Applications. 3rd edition. John Wiley & Sons Ltd., 2020.

22. Nilsson Nils, J. 1980. Principles of Artificial Intelligence. Elsevier.

23. Rich, Knight and Nair. Artificial Intelligence. Tata McGraw Hill.

24. Saha, S. K. 2014. Introduction to Robotics. Tata McGraw Hills Education, 2014.

25. Schilling Robert, J. 1990. Fundamentals of robotics – Analysis and control. Prentice Hall of India

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester -VI)

Major Elective Theory Course

Course Code – SAGFET1351

Title of the Course: NATURAL FARMING

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

Course Prerequisite:

1. Students should have a basic understanding of crop production, soil science, and agronomy.
2. Knowledge of farming systems, organic inputs, nutrient management, and ecological principles will help in better understanding of natural farming concepts and practices.

Course objectives:

1. To provide comprehensive understanding and knowledge to students about natural farming.
2. To teach students the concept, need and principles of native ecology-based production under natural farming.
3. To impart practical knowledge of natural farming and related agricultural practices in Indian and global environmental and economic perspectives.

Course Outcomes (COs):

1. **CO1 (Knowledge – Remember/Understand):**
   Explain the fundamental principles, philosophy, and scope of natural farming and its relevance to sustainable agriculture.
2. **CO2 (Understanding – Comprehension):**
   Describe different components of natural farming systems such as soil health management, indigenous practices, and ecological balance.
3. **CO3 (Application – Apply):**
   Apply natural farming practices like mulching, Jeevamrit, Beejamrit, and botanical extracts in crop production systems.
4. **CO4 (Analysis – Analyze):**
   Analyze the impact of chemical-free farming practices on soil fertility, biodiversity, and environmental sustainability.
5. **CO5 (Evaluation – Evaluate):**
   Evaluate the effectiveness of natural farming techniques compared to conventional farming systems in terms of productivity, cost, and sustainability.
6. **CO6 (Skill/Creation – Create):**
   Develop a model plan for a small-scale natural farm integrating livestock, crops, and on-farm resource recycling.

Curriculum Details: SAGFET1351- Natural Farming

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction to Natural Farming**	**8**
	1.1	Natural Farming-Indian Heritage of Ancient Agriculture; History of Natural Farming	
	1.2	Natural Farming-Definition, Objectives, Essential characteristics and Principles of Natural Farming	
	1.3	Scope and importance of Natural Farming,	
	1.4	Importance of natural farming in view of: Climate change, Soil health, Water use, Carbon sequestration, biodiversity conservation, Food security, Nutritional security and Sustainable development goals (SDGs)	
2.0		**Natural farming and farm**	**7**
	2.1	Main Pillars of Natural Farming (Jivamrit, Beejamrit, Mulching Whapasa)	
	2.2	Methods/Types/Schools of Natural Farming,	
	2.3	Characteristics and Design of a Natural farm	
	2.4	Integration of crops, trees and animals, Cropping system approaches	
3.0		**Ecological Balance in Natural Farming *vs* Other Farming**	**8**
	3.1	Concept of Ecological Balance, Ecological Engineering and Community Responsibility in Natural versus Other farming systems	
	3.2	Introduction to Concept of Ecological, Water, Carbon and Nitrogen footprints	
	3.3	Biodiversity, Indigenous seed production, Farm waste recycling,	
	3.4	Water conservation and Renewable energy use approaches on a Natural farm	
4.0		**Management and Promotion of Natural Farming**	**7**
	4.1	Nutrient management in Natural Farming and their sources; Insect, pest, disease and weed management under Natural Farming	
	4.2	Mechanization in Natural Farming	
	4.3	Initiatives taken by Government (Central/State), NGOs and other organizations for promotion of Natural farming and Chemical-free agriculture	
	4.4	Entrepreneurship opportunities in Natural Farming; Marketing and Export potential of Natural Farming Produce and products.	
		Total	**30**

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Major Elective Practical Course

Course Code – SAGFEP 1351

Title of the Course: Practical Based on SAGFET 1351

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

CURRICULUM DETAILS: SAGFEP 1351: PRACTICAL BASED ON SAGFET 1351

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Visit of natural farm and chemical-free traditional farms to study the various components and operations of Natural farming principles at the farm	4
2-3.	Indigenous technical knowledge (ITK) for seed, tillage, water, nutrient, insect pest, disease and weed management	8
4.	On-farm inputs preparation methods and protocols	4
5.	Studies in green manuring in-situ and green leaf manuring	4
6-7.	Studies on different types of botanicals and animal urine and dung based non-aerated and aerated inputs for plant growth	8
8.	Nutrient management in Natural Farming	4
9-10	Insect and pest and disease management in Natural Farming	8
11.	Weed management practices in Natural Farming	4
12.	Techniques of Indigenous Seed Production- Storage and marketing,	4
13.	Partial and complete nutrient and financial budgeting in Natural Farming.	4
14.	Evaluation of ecosystem services in Natural Farming (Crop, Field and System)	4
15.	Case studies and Success stories in Natural Farming and Chemical-free Traditional Farming.	4
	Total	**60**

Text Books and Reference Books:

1. Ayachit, S.M. 2002. *Kashyapi Krishi Sukti* (A Treatise on Agriculture by Kashyapa). Brig Sayeed Road, Secunderabad, Telangana: Asian Agri-History Foundation 4: 205.

2. Boeringa, R. (Eed.). 1980. Alternative Methods of Agriculture. Elsevier, Amsterdam, 199 pp.

3. Das, P., Das, S.K., Arya, H.P.S., Reddy, G. Subba, Mishra, A. and others: Inventory of Indigenous Technical Knowledge in Agriculture: Mission mode Project on Collection, Documentation and Validation of Indigenous Technical Knowledge, Document 1 To 7, Indian Council of Agricultural Research, New Delhi.

4. Ecological Farming -The Seven Principles of a Food System That Has People at its Heart. May 2015, Greenpeace.

5. FAO. 2018. The 10 Elements of Agro-ecology: Guiding the Transition to Sustainable Food and Agricultural system. https://www.fao.org/3/i9037en/i9037en.pdf Agro-ecosystem Analysis for Research and Development Gordon R. Conway.1985.

6. Fukuoka, M. 1978. The One-Straw Revolution: An Introduction to Natural Farming. Rodale Press, Emmaus, PA. 181 pp.

7. Fukuoka, M. 1985. The Natural Way of Farming: The Theory and Practice of Green Philosophy. Japan Publications, Tokyo, 280 pp.

8. Hill S.B and Ott. P. (Eeds.). 1982. Basic Techniques in Ecological Farming Berkhauser Verlag, Basel, Germany, 366 pp.

9. HLPE. 2019. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A Report by the High-Level Panel of Experts on Food Security and nutrition of the Committee on World Food Security, Rome. https://fao.org/3/ea5602en/ea5602en.pdf.

10. INFRC. 1988. Guidelines for Nature Farming Techniques. Atami, Japan. 38 pp.

11. Khurana, A. and Kumar, V. 2020. State of Organic and Natural Farming: Challenges and Possibilities, Centre for Science and Environment, New Delhi.

12. Malhotra R. and S.D. Babaji. 2020. Sanskrit Non-Translatable- The Importance of Sanskritizing English. Amaryllis, New Delhi, India.

13. Nalini, S. 1996. *Vrikshayurveda* (The Science of Plant Life) by Surapala. AAHF Classic Bulletin 1. Asian Agri-History Foundation, Brig Sayeed Road, Secunderabad, AP (now Telengana), India. 94 pp.

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester -VI)

Major Elective Theory Course

Course Code – SAGFET1351

Title of the Course: AGRIBUSINESS MANAGEMENT

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

Course Prerequisite:

1. Students should have a basic understanding of agricultural production systems, farm management principles, and elementary economics.
2. Knowledge of crop production, agricultural marketing, and rural development concepts will help in better comprehension of agribusiness operations and decision-making processes.

Course Objectives:

1. To impart knowledge on understanding the concepts processes, significance, and role of management and organizational behaviour.
2. To provide students with a clear understanding of the principles, concepts, and scope of agribusiness management in the agricultural sector.
3. To develop knowledge of agricultural marketing systems, value chains, and supply chain management in agribusiness enterprises.
4. To equip learners with managerial and entrepreneurial skills required for planning, organizing, and operating agribusiness ventures.
5. To enable students to understand financial management, risk analysis, and policy frameworks influencing agribusiness development and decision-making.

Course Outcomes (COs):

1. **CO1:** Explain the fundamental concepts, scope, and importance of agribusiness management in the agricultural economy. *(Understanding)*
2. **CO2:** Analyze agricultural marketing systems, supply chains, and value addition processes in agribusiness. *(Analyzing)*
3. **CO3:** Apply managerial and entrepreneurial skills for planning and operating agribusiness enterprises. *(Applying)*
4. **CO4:** Evaluate financial management tools, risk factors, and policy frameworks affecting agribusiness decisions. *(Evaluating)*
5. **CO5:** Develop strategies for sustainable and profitable agribusiness ventures in real-world scenarios. *(Creating)*

Curriculum Details: SAGFET1351- Agribusiness Management

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction to Agribusiness**	**8**
	1.1	Agribusiness: Meaning of Agribusiness, Definition of Agribusiness, Transformation of agriculture into agribusiness,	
	1.2	Various stakeholders and components of Agribusiness systems	
	1.3	Importance of Agribusiness in Indian Economy	
	1.4	New Agricultural Policies	
2.0		**Agro-based Industries**	**7**
	2.1	Importance of Agro based Industries Need of Agro based Industries,	
	2.2	Classification of Agro based Industries, Types of Agro based Industries	
	2.3	Procedure to set up agro-based Industries	
	2.4	Constraints in establishing Agro based Industrie	
3.0		**Agricultural Value Chain**	**8**
	3.1	Agricultural Value Chain: Value Chain Concept	
	3.2	Understanding primary and support activities and their linkages	
	3.3	Business Environment: PEST and SWOT analysis.	
	3.4	Management Functions, Components of a business plan	
4.0		**Marketing Management**	**7**
	4.1	Meaning of Marketing, Definition of Marketing, Concepts of Marketing	
	4.2	Marketing Mix: Meaning, 4 Ps of Marketing	
	4.3	Market Segmentation - Meaning and concept, Methods of Market.	
	4.4	Project: Meaning of Project, Definition of Project, Concept of Project, Types of Agricultural Projects	
		Total	**30**

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Major Elective Practical Course

Course Code – SAGFEP 1351

Title of the Course: Practical Based on SAGFET 1351

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

CURRICULUM DETAILS: SAGFEP 1351: PRACTICAL BASED ON SAGFET1351

Sr. No	Practical Exercises	Hrs. Required
1.	Study of Input Market: Seed Fertilizer, Pesticides	4
2.	Study of Output Market: Grain, Fruits, Vegetable, Flower	4
3.	Study of Product Market: Retail trade commodity trading, value added	4
4.	Study of Financing Institutions, Co-operatives, Commercial Banks	4
5.	Study of Regional Rural Bank	4
6.	Study of Agribusiness Finance Limited	4
7.	Study of NABARD	4
8.	Appraisal of Irrigation Project	4
9.	Case study of Agro based Industries	4
10.	Visit to Financial Institution	4
11.	Study of Financial Test Ratios for Evaluation Agro based Industries	4
12.	Study of Methods of Project Evaluation	4
13.	Study on E-Commerce of Agricultural Commodities	4
14.	Visit to Export Market of Fruits/Vegetables/Flowers/Grains	4
15.	Visit to Processed Industries/Malls/Producer's Companies	4
	Total	**60**

Text Books and Reference Books:

1) Agribusiness Management by Dr. Shivaji Nagpure & Dr. R.G. Deshmukh, M/s. AGROMET Publishers, Nagpur.

2) Indian Agriculture & Agri-Business Management by Dr. Smita Diwase, M/s. Scientific Publishers, Jodhpur, Rajasthan.

3) Agricultural Finance & Management by S. Subha Reddy, & P. Raghu Ram, M/s. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.

4) Agri Business Management by Dr. J.S. Amarnath & Dr. A.P.V. Samvel, M/s. Satish Serial Publishing House, Delhi-110033.

5) The Agribusiness Book by Mukesh Pandey, Deepali Tewari, M/s. ibdc Publishers, Lukhnow (U.P.), Pin-226 001.

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Vocational Skill Course

Course Code – SAGFVC 1351

Title of the Course: Preservation of Fruits and Vegetables

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

Course pre-requisite:

1. Students should have basic knowledge of horticultural crops, post-harvest handling, and fundamental principles of food science.
2. Understanding of fruit and vegetable production, maturity stages, and basic concepts of microbiology and hygiene will help in better comprehension of preservation techniques and processing methods.

Course Objectives:

1. To provide knowledge about the importance, scope, and principles of fruit and vegetable preservation.
2. To understand post-harvest physiology, spoilage mechanisms, and factors affecting shelf life of horticultural produce.
3. To impart skills in different preservation methods such as drying, freezing, canning, pickling, and chemical preservation.
4. To familiarize students with processing techniques, packaging methods, and quality control measures in fruit and vegetable products.
5. To develop entrepreneurial ability in establishing small-scale fruit and vegetable processing and preservation units.

Course Outcomes (COs):

1. **CO1:** Explain the principles, scope, and importance of fruit and vegetable preservation in post-harvest management. *(Understanding)*
2. **CO2:** Describe causes of spoilage and post-harvest changes in fruits and vegetables. *(Understanding)*
3. **CO3:** Apply different preservation techniques such as drying, freezing, canning, pickling, and chemical preservation. *(Applying)*
4. **CO4:** Analyze processing, packaging, and quality control methods for safe and value-added horticultural products. *(Analyzing)*
5. **CO5:** Develop small-scale preservation and processing models for entrepreneurial opportunities in horticulture. *(Creating)*

Curriculum details: SAGFVC1351: Preservation of Fruits and Vegetables

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Study of history, importance and scope of fruit and vegetable preservation	4
2.	Study of principles and methods of food preservation	4
3.	Study of selection criteria for site and layout of processing unit	4
4.	Study of different preservation techniques (thermal, chemical and low temperature methods)	4
5.	Study of dehydration techniques in fruits and vegetables	4
6.	Study of canning procedure of vegetables	4
7.	Study of food preservatives, permitted colours and flavours used in food industry	4
8.	Preparation of mango pulp and its preservation	4
9.	Preparation of fruit jam/jelly	4
10.	Preparation of fruit juice	4
11.	Preparation of fruit/vegetable pickles	4
12.	Preparation of fruit squash and marmalade	4
13.	Preparation of tomato juice and tomato sauce	4
14.	Preparation of banana chips	4
15.	Visit to food processing industry	4
	Total	**60**

Text Books and Reference Books:

1. Preservation of fruits and Vegetables -Girdharilal and Tondon
2. Foods and Nutrition – Sumati Mudambi
3. Hand book of Agriculture –ICAR Publications
4. Fruits and vegetables Preservation Girdharilal, Sidappa and Tondan
5. Post Harvest Physiology, Handling, Utilization of tropical and subtropical fruits and vegetables E.R.B. Pantastico
6. Preservation of fruits and vegetables – Principals and Practices Shrivastava and Sanjeev Kumar
7. Commercial fruits and Vegetable Products W.V.Cruess
8. Post Harvest handling of fruits and Vegetables Bal and Sandhu.

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B.Sc. Agrochemicals and Fertilizers, III Year (Semester -VI)

Course Code – SAGFOJ1351

Title of the Course: ON JOB TRAINING

[No. of Credits: 4 Credit] **[Total: 120 Hours]**

ON JOB TRAINING (OJT)

Course Description:

On Job Training (OJT) provides students with hands-on experience in agro-based industries, Fertilizer industries, agrochemicals companies. It helps them understand real-time industrial operations, production processes, and management systems.

Objectives:

1. To understand the working and organization of agro-industries.
2. To gain practical knowledge of production, processing, and quality control.
3. To study cost analysis, marketing strategies, and supply chain systems.
4. To develop professional skills and industrial exposure.

Learning Outcomes:

After completion of OJT, students will be able to:

- Explain industrial processes and workflow.
- Analyze production cost and marketing systems.
- Understand industrial management practices.
- Develop employability and entrepreneurship skills.

Components of OJT:

Sr. No.	Component	Details	Hours
1	**Industrial Orientation**	Introduction to industry, plant layout, raw materials, product line, safety rules, and standard operating procedures (SOPs).	30
2	**Process & Production Training**	Documentation of training experience, observations, and learning outcomes. A final report must be submitted at the end of training.	30
3	**Process & Production Training**	Study of manufacturing processes, reaction conditions, process flow diagrams, and production techniques.	30
4	**Quality Control & Analytical Techniques**	Waste management, effluent treatment, pollution control, industrial safety measures, and regulatory compliance.	15
5	**Project Work & Report Preparation**	Data collection, analysis, industrial problem identification, report writing, presentation, and viva.	15