

COURSE SCHEME & SYLLABUS
B.Sc. (Hons) Agriculture
(Four-Year Course)



Department of Natural Sciences

UISH

Sant Baba Bhag Singh University

2017-2021

FACULTY OF AGRICULTURAL SCIENCES

COURSE SCHEME & SYLLABUS
(MODIFIED IN ACCORDANCE WITH 5TH DEANS'
COMMITTEE REPORT)

FOR

B.Sc. (Hons) Agriculture

(Four-Year Course)

1st to 8th SEMESTER

Examination 2017-2018 onwards

Applicable for admissions in 2017

Course Scheme for B.Sc. (Hons.) Agriculture

Scheme of Courses B. Sc. (Hons.) Agriculture SEMESTER-I						
S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
Theory Subjects (including Non Credit Courses)						
1	AGR101	Introduction to agricultural sciences	4:0:0	4:0:0	4	4
2	AGR105	Elementary Microbiology	4:0:0	4:0:0	4	4
3	AGR109	Principles of Agricultural Economics	3:0:0	3:0:0	3	3
4	BOT105	Botany and Genetics	4:0:0	4:0:0	4	4
5	ENG101	General English	3:0:0	3:0:0	3	3
6	PBI101	General Punjabi	2:0:0	Non-Credit	2	NC
Practical Subjects						
7	AGR103	Introduction to agricultural sciences (Lab)	0:0:4	0:0:2	4	2
8	AGR107	Elementary Microbiology (Lab)	0:0:4	0:0:2	4	2
9	BOT107	Botany & genetics (Lab)	0:0:4	0:0:2	4	2
10	PT101/103/105	NCC/NSS/NSO	2:0:0	Non-Credit	2	NC
Total					34	24

Total Contact hrs: 36
Total Credit Hours: 24

Scheme of Courses B. Sc. (Hons.) Agriculture SEMESTER-II						
S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
Theory Subjects (including Non-Credit Courses)						
1	AGR102	Introductory Agriculture and Principles of Agronomy	4:0:0	4:0:0	4	4
2	AGR106	General Horticulture	3:0:0	3:0:0	3	3
3	AGR110	Elementary Biochemistry	4:0:0	4:0:0	4	4
4	BOT102	Plant Physiology	5:0:0	5:0:0	5	5
5	AGR118	Manures & fertilizers	3:0:0	3:0:0	3	3
6	AGR120	Rural Sociology and Educational Psychology	3:0:0	3:0:0	3	3
7	ZOO106	Basic Zoology	3:0:0	3:0:0	3	3
8	MAT114	Basic Mathematics	3:0:0	3:0:0	3	3
Practical Subjects						
9	AGR104	Principles of Agronomy (Lab)	0:0:2	0:0:1	2	1
10	AGR108	General Horticulture (Lab)	0:0:2	0:0:1	2	1
11	AGR112	Elementary Biochemistry (Lab)	0:0:4	0:0:2	4	2
12	BOT104	Plant physiology (Lab)	0:0:2	0:0:1	2	1
				Total	35	30

*There will be training of 2 weeks (in relation to skill enhancement) at the end of even semester.

1. Mathematics for those students who have passed 10+2 (Medical)
2. Zoology for those students who have passed 10 +2 (Non-Medical)

Total Contact hrs: 35
Total Credit Hours: 30

Scheme of Courses B. Sc. (Hons.) Agriculture
Semester III

S. No.	Subject/ Paper Code	Subject Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1.	AGR201	Crop Production Technology – I (<i>Kharif Crops</i>)	1	0	2	3	2 (1+1)
2.	AGR203	Fundamentals of Plant Breeding	2	0	2	4	3 (2+1)
3.	AGR205	Agricultural Finance and Cooperation	2	0	2	4	3 (2+1)
4.	AGR207	Agri- Informatics	1	0	2	3	2(1+1)
5.	AGR209	Farm Machinery and Power	1	0	2	3	2 (1+1)
6.	AGR211	Production Technology for Vegetables and Spices	1	0	2	3	2 (1+1)
7.	AGR213	Environmental Studies and Disaster Management	2	0	2	4	3(2+1)
8.	MAT209	Statistical Methods	1	0	2	3	2(1+1)
9.	AGR215	Livestock and Poultry Management	3	0	2	5	4 (3+1)
10.	AGR217	Introduction to Forestry	1	0	2	3	2 (1+1)
TOTAL			15		20	35	25

Total Contact Hours: 35

Total Credit Hours: 25

Scheme of Courses B. Sc. (Hons.) Agriculture

Semester IV

S. No.	Subject/ Paper Code	Subject Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1.	AGR202	Crop Production Technology –II (<i>Rabi Crops</i>)	1	0	2	3	2(1+1)
2.	AGR204	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	2	3	2(1+1)
3.	AGR206	Renewable Energy and Green Technology	1	0	2	3	2(1+1)
4.	AGR208	Problematic Soils and their Management	2	0	0	2	2(2+0)
5.	AGR210	Production Technology for Fruit and Plantation Crops	1	0	2	3	2(1+1)
6.	AGR212	Principles of Seed Technology	1	0	4	5	3(1+2)
7.	AGR214	Farming System & Sustainable Agriculture	1	0	0	1	1(1+0)
8.	AGR216	Agricultural Marketing Trade & Prices	2	0	2	4	3(2+1)
9.	AGR218	Introductory Agro- meteorology & Climate Change	1	0	2	3	2(1+1)
10.	AGR220	Introductory Soil and Water conservation Engineering	1	0	2	3	2(1+1)
11.	AGR222	Human Values and Ethics	1	0	0	1	1(1+0)
12.	AGR224/226 /228	Elective Course	1/2 ϕ	0	4/2 ϕ	5/4 ϕ	3 credit ϕ
TOTAL			13+ 1/2 ϕ		18+ 4/2 ϕ	31+5/4ϕ (35/36)	25

ϕ Students have to opt 3 credits course which can be 1+2 or 2+1 course. (preferably 2+1 course.)

Total Contact Hours: 31+5/4 ϕ (35/36)

Total Credit Hours: 25

- **Note:** SBBSU University will offer elective courses depending upon the availability of faculty (specialization of available faculty).

Scheme of Courses B. Sc. (Hons.) Agriculture
Semester V

S. No.	Subject/ Paper Code	Subject Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1.	AGR301	Principles of Integrated Pest and Disease Management	2	0	2	4	3(2+1)
2.	AGR303	Manures, Fertilizers and Soil Fertility Management	2	0	2	4	3 (2+1)
3.	AGR305	Pests of Crops and Stored Grain and their Management	2	0	2	4	3 (2+1)
4.	AGR307	Diseases of Field and Horticultural Crops and their Management -I	2	0	2	4	3 (2+1)
5.	AGR309	Crop Improvement-I (<i>Kharif Crops</i>)	1	0	2	3	2 (1+1)
6.	AGR311	Entrepreneurship Development and Business Communication	1	0	2	3	2 (1+1)
7.	AGR313	Geoinformatics and Nano-technology and Precision Farming	1	0	2	3	2 (1+1)
8.	AGR315	Practical Crop Production – I (<i>Kharif</i> crops)	0	1	4	4	2 (0+2)
9.	AGR317	Intellectual Property Rights	1	0	0	1	1(1+0)
10.	AGR319	Agricultural Heritage	1	0	0	1	1(1+0)
11.	AGR321/323 /325/327	Elective Course	1/2 ϕ	0	4/2 ϕ	5/4 ϕ	3 credit ϕ
TOTAL			13+ 1/2 ϕ		18+ 4/2 ϕ	31+5/4ϕ (34/35)	25

ϕ Students have to opt 3 credits course which can be 1+2 or 2+1 course. (preferably 2+1 course.)

Total Contact Hours: 31+5/4 ϕ (34/35)

Total Credit Hours: 25

- **Note:** SBBSU University will offer elective courses depending upon the availability of faculty (specialization of available faculty) .

Scheme of Courses B. Sc. (Hons.) Agriculture
Semester VI

S. No.	Subject/ Paper Code	Subject Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1.	AGR302	Rainfed Agriculture & Watershed Management	1	0	2	3	2 (1+1)
2.	AGR304	Protected Cultivation and Secondary Agriculture	1	0	2	3	2 (1+1)
3.	AGR306	Diseases of Field and Horticultural Crops and their Management-II	2	0	2	4	3 (2+1)
4.	AGR308	Post-harvest Management and Value Addition of Fruits and Vegetables	1	0	2	3	2 (1+1)
5.	AGR310	Management of Beneficial Insects	1	0	2	3	2 (1+1)
6.	AGR312	Crop Improvement-II (<i>Rabi</i> crops)	1	0	2	3	2 (1+1)
7.	AGR314	Practical Crop Production –II (<i>Rabi</i> crops)	0	1	4	4	2 (0+2)
8.	AGR316	Principles of Organic Farming	1	0	2	3	2 (1+1)
9.	AGR318	Farm Management, Production & Resource Economics	1	0	2	3	2 (1+1)
10	AGR320	Principles of Food Science and Nutrition	2	0	0	2	2(2+0)
11.	AGR322/324 /326/328/330	Elective Course	1/2 ϕ	0	4/2 ϕ	5/4 ϕ	3 credit ϕ
TOTAL			11+ 1/2 ϕ		20+ 4/2 ϕ	31+5/4ϕ (35/36)	24

ϕ Students have to opt 3 credits course which can be 1+2 or 2+1 course. (preferably 2+1 course.)

Total Contact Hours: 31+5/4 ϕ (35/36)

Total Credit Hours: 24

- **Note:** SBBSU University will offer elective courses depending upon the availability of faculty (specialization of available faculty).

**Scheme of Courses B. Sc. (Hons.) Agriculture
Semester VII**

S. No.	Subject/ Paper Code	Subject Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1	AGR401	General orientation & On campus training by different faculties Village attachment Unit attachment in Univ./ College. KVK/ Research Station Attachment	0	1	21	21	14
2	AGR403	Plant clinic	0	1	2	2	2
3	AGR405	Agro-Industrial Attachment	0	1	4	4	4
4	AGR407	Fundamentals of Plant Pathology	3	0	2	5	4
5	AGR409	Fundamentals of Entomology	3	0	2	5	4
			6		31	37	28

Total Contact Hours: 37

Total Credit Hours: 28

Instructions to conduct RAWE &AIA for the B.Sc. (Hons.) Agriculture VII Semester

SN.	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA)		
	Activities	No. of weeks	Credit Hours
1	General orientation & On campus training by different faculties	1	14
2	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
3	Plant clinic	2	02

	Agro-Industrial Attachment	3	04
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

- **Agro- Industrial Attachment:** The students would be attached with the agro-industries for a period of 3 weeks to get an experience of the industrial environment and working.

RAWE Component-I Village Attachment Training Programme

Sl. No.	Activity	Duration
1	Orientation and Survey of Village	1 week
2	Agronomical Interventions	1 week
3	Plant Protection Interventions	1 week
4	Soil Improvement Interventions (Soil sampling and testing)	1 week
5	Fruit and Vegetable production interventions	1 week
6	Food Processing and Storage interventions	
7	Animal Production Interventions	1 week
8	Extension and Transfer of Technology activities	1 week

RAWE Component –II Agro Industrial Attachment

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.
- Industries include Seed/Sapling production, Pesticides-insecticides, Post harvest-processing-value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

- Acquaintance with industry and staff
- Study of structure, functioning, objective and mandates of the industry
- Study of various processing units and hands-on trainings under supervision of industry staff
- Ethics of industry
- Employment generated by the industry
- Contribution of the industry promoting environment
- Learning business network including outlets of the industry
- Skill development in all crucial tasks of the industry
- Documentation of the activities and task performed by the students
- Performance evaluation, appraisal and ranking of students

- **Note:** SBBSU University will offer the RAWE component depending upon the availability of sources or faculty (specialization of available faculty) .

Scheme of Courses B. Sc. (Hons.) Agriculture
Semester VIII

Students of Semester VIII (applicable for admission in 2017, batch 2017-2021) will also study the three courses (C-1, C-2 and C-3) not studied earlier in First year (as per 5th Deans' Committee Report) along with optional following 2 modules.

Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the **VIII semester.**

- **Note:** SBBSU University will offer the modules depending upon the availability of sources/ faculty (specialization of available faculty) .

S. No.	Subject/ Paper Code	Subject/Module Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
C-1	AGR402	Principles of Biotechnology	1	0	2	3	2 (1+1)
C-2	AGR404	Fundamentals of Soil Sciences	2	0	2	4	3 (2+1)
C-3	AGR406	Agricultural Extension	2	0	2	4	3 (2+1)
S. No.	Subject/ Paper Code	Subject/Module Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1	AGR408	Production Technology for Bioagents and Biofertilizer	0	1	20	20	0+10
2	AGR410	Seed Production and Technology	0	1	20	20	0+10
3	AGR412	Mushroom Cultivation Technology	0	1	20	20	0+10
4	AGR414	Soil, Plant, Water and Seed Testing	0	1	20	20	0+10
5	AGR416	Commercial Beekeeping	0	1	20	20	0+10
6	AGR418	Poultry Production Technology	0	1	20	20	0+10
7	AGR420	Commercial Horticulture	0	1	20	20	0+10
8	AGR422	Floriculture and Landscaping	01	1	20	20	0+10

9	AGR424	Food Processing	0	1	20	20	0+10
10	AGR426	Agriculture Waste Management	0	1	20	20	0+10
11	AGR428	Organic Production Technology	0	1	20	20	0+10
12	AGR430	Commercial Sericulture	0	1	20	20	0+10

Total Credit Hours: 28
(8 credits from C-1, C-2 and C-3 + 20 credits from Module)

Evaluation of Experiential Learning Programme/ HOT

Sl.No.	Parameters	Max. Marks
1.	Project Planning and Writing	10
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
5.	Output delivery	10
6.	Technical Skill Development	10
7.	Entrepreneurship Skills	10
8.	Business networking skills	10
9.	Report Writing Skills	10
10.	Final Presentation	10
	Total	100

LIST OF ELECTIVE COURSES

A student can select three elective courses out of the following and offer during 4th, 5th and 6th semesters.

NOTE: The Student of 6th semester should prefer 2+1 course (3 credits course).

S. No.	Subject/ Paper Code	Subject Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1	AGR224	Agribusiness Management	2	0	2	4	3(2+1)
2	AGR226	Agrochemicals	2	0	2	4	3(2+1)
3	AGR228	Commercial Plant Breeding	1	0	4	5	3(1+2)
4	AGR321	Landscaping	2	0	2	4	3(2+1)
5	AGR323	Food Safety and Standards	2	0	2	4	3(2+1)
6	AGR325	Biopesticides & Biofertilizers	2	0	2	4	3(2+1)
7	AGR327	Protected Cultivation	2	0	2	4	3(2+1)
8	AGR322	Micro propagation Technologies	1	0	4	5	3(1+2)
9	AGR324	Hi-tech. Horticulture	2	0	2	4	3(2+1)
10	AGR326	Weed Management	2	0	2	4	3(2+1)
11	AGR328	System Simulation and Agro-advisory	2	0	2	4	3(2+1)
12	AGR330	Agricultural Journalism	2	0	2	4	3(2+1)

SEMESTER-I

Course Code	AGR 101
Course Title	Introduction to Agricultural Sciences
Type of course	Theory
L T P	4 0 0
Credits	4 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objectives	To familiarize with meteorology, soil science & their fundamentals.

INTRODUCTION TO AGRICULTURAL SCIENCES

Theory

UNIT- I

Agro meteorology- Definitions, Importance and Scope. General Climatology. Agroclimatic zones of India and Punjab. Weather and climate. Weather elements and their influence on different crops .

UNIT- II

Introduction to monsoons. Elementary aspects of weather forecasting. Weather modification -cloud seeding. Remote sensing. Climatic classifications. Weather hazards in agriculture. Effects of climate change on agriculture.

UNIT- III

Concept of land, soil and soil science. Composition of earth crust and its relationship with soils. Weathering. Soil forming factors and processes. Soil profile. Soil colour. Elementary knowledge of taxonomic classification of soils. Soils of Punjab and India. Soil physical properties. Soil texture– textural classes. Soil structure– classification, soil consistency, bulk density and particle density of soils and porosity, their significance.

UNIT-IV

Soil colloids– properties, nature, types and significance. Sources of charges in clay minerals. Soil organic matter–decomposition, mineralization, humus. Carbon cycle, C: N ratio. Soil organisms and their beneficial and harmful roles.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Pedology	J L Sehgal	Kalyani Publishers
2	Introduction to climatology for tropics	J D Yeade	John Wiley and Sons's Ltd.
3	General Climatology	Critbbfierd &	Prentice Hall

		Hewarda	
4	Agricultural Meteorology	H S Mavi	Kalyani Publishers

Course Code	AGR105
Course Title	Elementary Microbiology
Type of course	Theory
L T P	4 0 0
Credits	4 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objectives	To familiarize with microbiology & their fundamentals.

ELEMENTARY MICROBIOLOGY

Theory

UNIT- I

Introduction: Micro organisms, Microbiology, History and its applied areas, Discovery of Micro organisms and their role in fermentation, Germ Theory of Diseases and protection. Eukaryotic Diversity: Structure and Characteristics, major group of eukaryotes: Fungi, Algae, and Protozoa.

UNIT- II

Prokaryotic Diversity: Structure and characteristics; major group of prokaryotes: Actinomycetes, Chlamydia, Rickettsias, Archaeobacteria, Cyanobacteria. Difference between Prokaryotes and Eukaryotes. Metabolism in Bacteria: Bacterial Growth, ATP Generation, chemoautotrophy, photoautotrophy, respiration, fermentation.

UNIT- III

Bacteriophages: Structure and properties; lytic and lysogenic life cycle, virioids and prions. Genetic Recombination: Occurrence of Mutation and its types, Practical Implications of Mutation, Genetic Recombination in Bacteria: Conjugation, Transformation, Transduction. Soil Microbiology: Soil components and microbial population, Microbial transformation of Carbon, Nitrogen and Sulphur.

UNIT-IV

Water Microbiology: Micro organisms in water, Role of Microbes in Composting and Vermicomposting, Biodegradation, Biogas Production. Beneficial micro organisms in Agriculture: Biofertilisers, Microbial pesticides Biological Nitrogen Fixation: Modes of

Nitrogen Fixation; Enzymes and Mechanism of Nitrogen fixation Food Microbiology: Microbes as food: SCP, Mushroom Cultivation.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Microbiology	R P Singh	Kalyani Publishers
2	General Microbiology	R P Singh	Kalyani Publishers
3	Mushroom cultivation	PAU	PAU
4	Agricultural Microbiology	N Mukhrjee & T Ghose	Kalyani Publishers

Course Code	AGR109
Course Title	Principles of Agricultural Economics
Type of course	Theory
L T P	3 0 0
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course Objectives (CO)	To familiarize the students with agriculture economics and their fundamental.

PRINCIPLES OF AGRICULTURAL ECONOMICS

Theory:

UNIT-I

Meaning, definition, subject matter, basic economic concepts.

Wants– Meaning and characteristics.

Theory of consumption– marginal utility analysis.

UNIT-II

Demand– Meaning, definition, kinds of demand, law of demand, change in demand.

Elasticity of demand– various types, degrees, methods of measurement, importance and factors influencing elasticity of demand.

UNIT- III

Theory of supply. Elasticity of supply.

Consumer's surplus.

National income– Concepts, Measurement.

UNIT-IV

Money- Definition, Quantity theory of money.

Inflation – Meaning, definition, kinds of inflation.

Public Finance.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Elementary Principles of Economics	Jather & Berry	Mcmillan Co.
2	Modern Economics Theory	K K Dewitt	Premier Publishing Co.
3	Economics & Introductory Analysis	Paul Samuelson	McGraw Hill Book Co.
4	Micro- and Macro Economics: Introduction	T R Jain	V K Publications
5	Agricultural Economics	S S Chhina	Kalyani Publishers

Course Code	BOT105
Course Title	Botany & Genetics
Type of course	Theory
L T P	4 0 0
Credits	4 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course Objectives (CO)	To make students aware about botany and genetics and need of maintaining it with best possible knowledge.

BOTANY & GENETICS

UNIT-I

Classification and introduction to different groups of the plant kingdom, a general outline of the studies of an angiosperm, Life cycle of a flowering plant; annuals, biennials and perennials. Morphology: Structure of seeds of: Gram, Maize, and their germination; types of germination. Roots: External characters and functions, types of root systems and their bearing on agriculture practices. Major modifications of root systems and their significance.

UNIT-II

Stem: External characters and functions, Major modifications of stem. Leaf: Parts of a typical leaf and their functions; simple and compound leaves and their functions, venation and modifications of leaves; uses of leaves. Inflorescence: Elementary knowledge of simple and special types of inflorescences. Flower: Structure and functions of floral parts, modifications, floral diagram, floral formulae and vertical section of a flower, structure of the thalamus and insertion of the floral appendages on the thalamus, placentation. Pollination: Types of pollinations, agencies responsible (Anemophily and Entomophily) for pollination, contrivances for cross pollination. Fertilization: Fertilization and seed formation. Fruits: Elementary knowledge of fruits, dispersal of seeds and fruits with examples from Punjab what so ever is possible.

UNIT-III

History: pre-mendelian and post mendelian concepts of heredity, mendelian principles of heredity. Cell: Plant cell and animal cell, chromosome structure. Cell divisions-mitosis, meiosis, variation in chromosomes polytene chromosome, Lampbrush chromosome. Dominance relationship, gene interaction.

UNIT-IV

Multiple alleles. Sex determination and sex linkage, sex limited and sex influenced traits. Linkage, Crossing over, Structural changes in chromosomes: Deletions and Duplications, Translocation and inversion. "Numerical changes in chromosomes, chemical basis of heredity". Gene concept, mode of replication of genetic material, transcription and translational mechanisms of genetic material. Gene regulation and operon concept. Mutations: chemical and physical mutagens, mode of action of mutagens. Extranuclear inheritance. Polygene and quantitative inheritance.

Recommended books:

S.No.	Name	Author(S)	Publisher
1	Elementary Biology, Vol.II	K N Bhatia and M P Tyagi	Danika Publishing Co.
2	Principles of Genetics	Phundan Singh	Kalyani Publishers
3	Fundamentals of Genetics	B D Singh	Kalyani Publishers
4	Cell Biology and Genetics	H N Srivastava	Pradeep

Course Code	ENG 101
Course Title	General English
Type Course	Theory

L T P	2 0 0
Credits	2 0 0
Course Pre-requisite	
Course Objective (CO)	<ol style="list-style-type: none"> 1. The students will critically read and analyze the prescribed texts. 2. The students will demonstrate effective word choice, vocabulary, idioms, grammar and sentence structure allowing accurate communication of meaning in written work. 3. The students will recognize the correct usage of present/past/future tenses in contextualized speech.

UNIT I

Tales of Life :

- a. The Umbrella (Henry Rene Albert Guy de Maupassant)
- b. The Story Teller (H.H. Munro Saki)
- c. The Lament (Anton Pavlovich Chakhov)

Prose for Young Learners:

- a. Universal Declaration Of Human Rights (U.N. Charter)
- b. Symptoms (Jerome K. Jerome)

UNIT-II

Exploring Tenses in English:

- a. Present and Past
- b. Present Perfect and Past

UNIT III

Tales of Life:

- a. The Luncheon (William Somerset Maugham)
- b. The Shroud (Prem Chand)

UNIT-IV

Prose for Young Learners:

- a. On Spendthrifts (A.G. Gardinar)
- b. The Power of Women (Richard Gardon)
- c. A Dialogue On Democracy (Albert Sydney Horby)

Exploring Tenses in English:

- a. Future

Recommended books:-

S.No.	Author(S)	Year	Title	Publisher
1	Singh, S	2008	Tales of Life	Press and Publication Department, Guru Nanak Dev University, Amritsar.
2	Tewari, A. K, Midha, V.K, Sharma, R.K	2011	Prose For Young Learners	Publication Bureau, Guru Nanak Dev University, Amritsar
3	Murphy, R	2015	English Grammar in Use	Cambridge University Press

Course Code	PBI101
Course Title	General Punjabi
Type of Course	Theory
L T P	2 0 0
Credits	NC
Course Prerequisite	
Course Objectives	<p>1. iividAwrQI AwDuink pMjwbI kvIAW dI jIvnI qoN jwxU hoxgy[</p> <p>2. iividAwrQIAW nUM AwDuink pMjwbI kivqw dI ivSYgg jwxkwrI ho jwvygI[</p> <p>3. iividAwrQIAW iv`c ryKw ic`qrW dw Alocnwqmk AiDAYn krn dw hunr auqpMn hovygw[</p> <p>4. iividAwrQIAW nUM pMjwbI DunIN ivauNqbMdI sMbMDI igAwn hwisl ho jwvygw[</p> <p>5. iividAwrQI pMjwbI aup- BwSwvW nUM pCwnxXog ho jwxgy[</p>

iekweI- a

1. AwDuink pMjwbI kivqw: BweI vIr isMG (rauN ru^, smW, ie`Cw bl qy fUMGIAW SwmW), DnI rwm cwiqRk(rwDw sMdyS, isdkW vwilAW dy byVy pwr ny), pRo. pUrn isMG(purwxy pMjwb nUM AwvwzW), &IrozdIn Sr&(kurbwnI, ^Yr pMjwbI dI), pRo. mohn isMG(Awau n`cIey, nvW kOqk), nMd lwl nUrpurI(cuMm cuMm r`Ko, mzdUr), AMimRqw pRIqm(bwrW mwh, sMXog ivXog), fw. hrBjn isMG(qyry hzUr myrI hwizrI dI dwsqW), iSv kumwr btwlvI(ibrhoN dI rVHk, z^m), surjIq pwqr(cONk ShIdW `c ausdw Awi^rI BwSx, Zzl)

2. pMjwb dy mhwn klwkwr(lyK): ky. AY~l. sihgl, bVy gulwm Ali KW, soBw isMG, ipRQvIrwj kpUr, BweI smuMd isMG[

iekweI- A

1. pMjwbI DunI ivauNq : aucwrn AMg, aucwrn sQwn qy
ivDIAW, svr, ivAMjn[

2. BwSw vMngIAW: BwSw dw tkswlI rUp, BwSw Aqy aup-
BwSw dw AMqr, pMjwbI aupBwSwvW dy pCwx icMnH[

pusqk sUcI

pwT- pusqkW

lyKk	Swl	pusqk	pbilSr
sMpwdk, iF`loN; h.s. Aqy srgoDIAw; p.s.	2014	do rMg	pblIkySn ibaUro, gurUu nwnk dyv XUnIvrstI, AMimRqsr
gwrGI; b.	1995	pMjwb dy mhwn klwkwr	pblIkySn ibaUro, gurUu nwnk dyv XUnIvrstI, AMimRqsr

sMbMiDq pusqkW

lyKk	Swl	pusqk	pbilSr
isMG; h.	1966	pMjwbI bwry	pMjwbI XUnIvrstI, pitAwlw
isMG; qIrQ (fw.)	2014	pMjwbI AiDAwpn	AY~s. jI. pbilSrz, jlMDr
syKoN; suKivMdr isMG (fw.) Aqy syKoN; mndIp kOr	2015	pMjwbI BwSw dw AiDAwpn	kilAwXI pbilSrz, luidAwXw

Course Code	AGR 103
Course Title	Introductory Agricultural Sciences Lab
Type of course	Practical
L T P	2 0 0

Credits	1 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

INTRODUCTORY AGRICULTURAL SCIENCES (LAB)

1. To Study About Agrometeorological Observatory.
2. To Prepare And Study The Layout Plan Of Agrometeorological Observatory.
3. To Study About Air Temperature By Stevenson's Screen.
4. To Study About Measurement Of Relative Humidity.
5. To Study About Wind Vane.
6. To Study About Minimum And Maximum Air Temperature.
7. To Study About Soil Thermometer.
8. To Study Agro-Climatic Zones And Agro-Ecological Regions Of India.
9. To Determine Soil Colour With Use Of A Munsell Colour Chart.
10. To Determine Soil Bulk Density.
11. To Determine Particle Density Of Soil And Calculate Soil Porosity.
12. Study of soil profile.
13. Soil structure determination by feel method.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Pedology	J L Sehgal	Kalyani Publishers
2	Introduction to climatology for tropics	J D Yeade	John Wiley and Sons's Ltd.

Course Code	AGR107
Course Title	Elementary Microbiology Lab
Type of course	Practical
L T P	2 0 0
Credits	1 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

ELEMENTARY MICROBIOLOGY LAB

Practical

1. To Study the autoclave

2. To study laminar air flow
3. To study the incubator.
4. To Study the hot air oven.
5. To Study the compound microscope.
6. To study the construction and function of a constant temperature water bath.
7. To study the working and function of qubec colony counter.
8. Preparation of culture media.
9. Enumeration of bacteria by social dilution technique (Serial dilution and pour plate technique).
10. To isolate microorganisms from soil sample by spread plate technique.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Agricultural Microbiology	N Mukhrjee & T Ghose	Kalyani Publishers

Course Code	BOT107
Course Title	Botany & Genetics Lab
Type of course	Practical
L T P	2 0 0
Credits	1 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

BOTANY & GENETICS LAB

1. Study of the form and structure of stems.
2. Study of the form and structure of simple and compound leaves.
3. Study of the form and structure of roots of important field and garden crops.
4. Study of the structure of flower and main types of inflorescences.
5. Study of the types of fruits of Agricultural importance.
6. Demonstration of monohybrid and dihybrid cross through charts
7. Identification of stages of mitotic cell division through permanent slides
8. DNA and RNA structure through models.

Recommended books:

S.No.	Name	Author(S)	Publisher
1	Fundamentals of Genetics	B D Singh	Kalyani Publishers

SEMESTER II

Course Code	AGR 102
Course Title	Introductory Agriculture and Principles of Agronomy
Type of course	Theory
L T P	4 0 0
Credits	4 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

INTRODUCTORY AGRICULTURE AND PRINCIPLES OF AGRONOMY

Theory

UNIT-I

Definition and importance of Agriculture; Meaning and scope of Agronomy. Factors affecting crop production, Classification of crops; Meaning and types of tillage and tith; Soil fertility and productivity. Seeds and Sowing.

UNIT-II

International Agricultural Research Institutes in India and abroad. Art, science and business of crop production; Agricultural heritage; Chronological agricultural technology development in India

UNIT-III

Ancient Indian Agriculture in Civilization Era; Conversion of man from food gatherer to food producer; Development of Agriculture through Kautilya`s work.

UNIT-IV

Plant protection in ancient and medieval India.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Principles of Agronomy	S R Reddy	Kalyani Publishers
2	Principles & Practices of Agronomy	S S Singh	Kalyani Publishers

3	Handbook of Agriculture	ICAR	ICAR New Delhi
4.	Ancient and Medieval History of Indian Agriculture	Choudhary, S.L., Sharma, G.S. and Nene, Y.L.	Rajasthan College of Agriculture, Udaipur

Course Code	AGR 106
Course Title	General Horticulture
Type of course	Theory
L T P	3 0 0
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

GENERAL HORTICULTURE

Theory

UNIT-I

Definition importance and scope of horticulture. Divisions of horticulture.

UNIT-II

Climatic zones of horticulture crops. Area and production of different fruit crops.

UNIT-III

Selection of site, fencing, and wind break, preparation of land and layouts of orchards systems, high density planting, planning and establishment.

UNIT-IV

Propagation and Nursery production. Methods of training, layering and pruning. Cultural practices of important fruits, flowering and fruiting, some important tropical (mango, guava), sub-tropical (citrus, grapes, pomegranate, litchi) and temperate fruits (peach, pear, plum)

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Fruit physiology and production	Amar Singh	Kalyani Publishers
2	Fruit Culture in India	Dr. Shyam Singh, Dr. S. Krishnamurthi	ICAR, New Delhi

		and Dr. S. L. Katyal	
4	Fundamentals of Horticulture	Jitendra Singh	Kalyani Publishers

Course Code	AGR 110
Course Title	Elementary Biochemistry
Type of course	Theory
L T P	4 0 0
Credits	4 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

ELEMENTARY BIOCHEMISTRY

UNIT-I

Biochemistry – Introduction and importance. Bio-molecules – Structure, properties & applications: Amino acids, peptides and proteins. Enzymes – Factors affecting the activity, classification, Immobilisation and other industrial applications.

UNIT-II

Lipids – Acyl lipids, Carbohydrates; Nucleotides and Nucleic acids. Plant cell, cell wall and its role in live stock, food and paper industries. Plant proteins and their quality.

UNIT-III

Metabolic energy and its generation – Metabolism – Basic concepts, Glycolysis, Citric acid Cycle, Pentose phosphate pathway, oxidative phosphorylation, Fatty acid oxidation. General reactions of amino acid degradation.

UNIT-IV

Biosynthesis – carbohydrates, Lipids, Proteins and Nucleic acids. Metabolic regulation. Secondary metabolites, Terpenoids, Alkaloids, Phenolics and their applications in food and pharmaceutical industries.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Principles of Biochemistry	A L Lehninger	WH Freeman publisher & Co.

2	Biochemistry- Environment & Agriculture	A P S Maan, S K Munshi and A K Gupta	Kalyani Publishers
3	Fundamentals of Biochemistry	J L Jain	S Chand

Course Code	BOT102
Course Title	Plant Physiology
Type of course	Theory
L T P	5 0 0
Credits	5 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

PLANT PHYSIOLOGY

Theory

UNIT-I

Introduction – Definition of Crop Physiology – Importance in Agriculture and Horticulture. Crop Water Relations – Physiological importance of water to plants – Water potential and its components, measurement of water status in plants. Crop water relations (contd.) Transpiration – Definition – significance – Transpiration in relation to Crop productivity – Water Use Efficiency – WUE in C₃, C₄ and CAM plants – Factors affecting WUE. Photosynthesis – Energy synthesis – Significance of C₃, C₄ and CAM pathway .

UNIT-II

Relationship of Photosynthesis and crop productivity – Translocation of assimilates – Phloem loading, apoplastic and symplastic transport of assimilates – Source and sink concept – Factors affecting Photosynthesis for productivity – Methods of measuring photosynthesis – Photosynthetic efficiency – Dry matter partitioning – Harvesting index of crops.

UNIT-III

Photorespiration and crop productivity. Respiration and its significance – Importance of glycolysis, TCA cycle. Pentose Phosphate Pathway – Growth respiration and maintenance respiration, Alternate respiration– Salt respiration–wound respiration – measurement of

respiration. Nutriophysiology– Definition – Mengel’s classification of plant nutrients – Physiology of nutrient uptake– Functions of Plant nutrients – Deficiency and toxicity symptoms of plant nutrients – Foliar nutrition – Hydroponics – solution and sand culture.

Physiology of flowering – Photoperiodism and Vernalisation in relation to crop productivity – Classification of plants – Commercial application of photoperiodism. Growth and Development – Definition – Types of growth – Determinate and Indeterminate growth – Monocarpic and Polycarpic species with examples, Measurement of growth – Growth analysis Growth characteristics – Definitions and mathematical formulae. Plant Growth Regulators – Occurrence – Biosynthesis – Mode of action of Auxins, Gibberellins, Cytokinins, ABA, Ethylene. Novel plant growth regulators – Commercial application of plant growth regulator in agriculture and horticulture.

UNIT-IV

Senescence and abscission – Definition – Classification – Theories of mechanism and control of senescence – Physiological and biochemical changes and their significance. Abscission and its relationship with senescence. Seed Physiology – Seed dormancy – Definition – types of seed dormancy – Advantages and disadvantages of seed dormancy - Causes and remedial measures for breaking seed dormancy with examples – Optimum conditions of seed storage – Factors influencing seed storage (ISTA standards). Post Harvest Physiology - Fruit ripening – Metamorphic changes – Climacteric and non-climacteric fruits – Hormonal regulation of fruit ripening (with ethrel, CCC, Polaris, paclobuterozole) – Use of hormones in increasing vase life of flowers.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Plant Physiology	H N Srivastava	Pradeep Publishers
2	Plant Physiology	N.K. Gupta & Sunita Gupta	Oxford and IBH publications, New Delhi
3	Seed Technology	R L Aggarwal	Oxford and IBH publications, New Delhi

Course Code	AGR 118
Course Title	Manures & Fertilizers
Type of course	Theory
L T P	3 0 0
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

MANURES & FERTILIZERS

Theory

UNIT-I

Introduction – Raw materials – Manures – Bulky and concentrated – FYM, Composts – Different methods, Vermicomposting, Green manures, Oil cakes, Sewage and sludge.

UNIT-II

Fertilizers – classifications, Manufacturing processes and properties of major nitrogenous fertilizers (ammonium sulphate, urea, calcium ammonium nitrate, ammonium nitrate, ammonium sulphate nitrate)

UNIT-III

Phosphatic (single super phosphate, enriched super phosphate, diammonium phosphate, ammonium poly phosphate).

UNIT-IV

Potassic and complex fertilizers their fate and reactions in the soil. Biofertilizers and their advantage.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Manures and Fertilizers	P C Das	Kalyani Publishers

Course Code	AGR 120
Course Title	Rural Sociology and Educational Psychology
Type of course	Theory
L T P	3 0 0
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

Theory

UNIT-I

Extension Education and Agricultural Extension – Meaning, Definition, Scope and Importance. Sociology and Rural Sociology-Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and Interrelationship between Rural Sociology & Agricultural Extension. Indian Rural Society-Important characteristics, Differences and Relationship between Rural and Urban societies. Social Groups – Meaning, Definition, Classification, Factors considered in formation and organization of groups, Motivation in group formation and Role of Social groups in Agricultural Extension.

UNIT-II

Social Stratification – Meaning, Definition, Functions, Basis for stratification, Forms of Social stratification – Characteristics and – Differences between Class & Caste System. Cultural concepts – Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions – Meaning, Definition and their Role in Agricultural Extension. Social Values and Attitudes – Meaning, Definition, Types and Role of Social Values and Attitudes in Agricultural Extension. Social Institutions – Meaning, Definition, Major institutions in Rural society, Functions and their Role in Agricultural Extension.

UNIT-III

Social Organizations – Meaning, Definition, Types of organizations and Role of Social organizations in Agricultural Extension. Social Control – Meaning, Definition, Need of social control and Means of Social control. Social change – Meaning, Definition, Nature of Social change, Dimensions of social change and factors of social change. Leadership – Meaning,

Definition, Classification, Roles of a leader, Different methods of Selection of Professional and Lay leaders. Training of Leaders – Meaning, Definition, Methods of training, Advantages and Limitations in use of local leaders in Agricultural Extension. Psychology and Educational Psychology – Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension.

UNIT IV

Personality – Meaning, Definition, Types, Factors influencing the Personality and Role of personality in Agricultural Extension. Perception – Meaning, Definition, Stages, Principles and Importance of perception in Agricultural Extension. Instincts and Emotions – Meaning, Definition, Characteristics, Types and Role of Emotions in Agricultural Extension. Motivation – Meaning, Definition, Motivation cycle, Types, Classification of Motives, Techniques of motivation and Role of Motivation in Agricultural Extension. Memory – Meaning, Definition, Factors, Conditions of Memory, Types of Memory and Importance of Memory in Agricultural Extension. Forgetting – Meaning, Definition, Forgetting curve and kind of forgetting. Teaching – Learning process – Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics. Principles of learning and their implication for teaching.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	A Text Book of Educational Psychology	H R Bhatia	Asia Publishing House, New Delhi.
2	Educational Psychology in Agriculture	D Pujari.	Agrotech Publishing Academy, Udaipur

Course Code	ZOO106
Course Title	Basic Zoology
Type of course	Theory
L T P	3 0 0
Credits	3 0 0
Course prerequisite	10+2 (Non Medical) or Equivalent

BASIC ZOOLOGY

Theory

UNIT-I

Cell structure, cell division, Biomolecules. Simple and compound tissues. Functional organization of various systems of a mammal.

UNIT-II

Gametogenesis and development of frog up to three germinal layers.

UNIT-III

Binomial nomenclature, classification and general survey of animal kingdom.

UNIT-IV

Common ecto and endoparasites of man and domestic animals.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Agricultural zoology	P S Dhami	S Chand & Co. Ltd.
2	A text book of general zoology	Linville, H.R. and Kelley, H.A	DPH Publications, New Delhi

Course Code	MAT114
Course Title	Basic Mathematics
Type of course	Theory
L T P	3 0 0
Credits	3 0 0
Course prerequisite	10+2 (Medical) or Equivalent
Course Objective (CO)	Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students : (1) To understand the theory knowledge as well as practical knowledge of different formulas.(2) To inculcate the skills to use different methods to solve the applied problems. (3) To check the accuracy of every formula by using different strategies. (4) To give them a sound foundation that eventually will help them in their coming technical futures.

BASIC MATHEMATICS

Theory

UNIT-I

Complex numbers: polar form of complex numbers, addition and multiplication of complex numbers, complex conjugate, modulus and argument of complex numbers. Binomial theorem for positive index.

UNIT-II

Matrices-definition, types of matrices,symmetric and skew symmetric matrices, addition and multiplication of matrices, cofactor of matrices,transpose. Determinants-adjoint of matrices, inverse of matrix.

UNIT-III

Differentiation: concept of differentiation, derivatives of some important functions, successive differentiation, chain rule, and product rule.

UNIT-IV

Integrals: Indefinite integration, properties of indefinite integrals integration by substitution. Integration by parts. Introduction to definite integrals.

Recommended Books:

S. No	Name	Author(S)	Publisher
2.	Mathematics for XI and XII Class	J P Mohindru	Modern Publications

Course Code	AGR 104
Course Title	Introductory agriculture and Principles of Agronomy Lab
Type of course	Practical
L T P	2 0 0
Credits	1 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course Objective (CO)	To become aware of different tillage implements and field practices.

INTRODUCTORY AGRICULTURE AND PRINCIPLES OF AGRONOMY LAB

Practical

1. Study of different hand tools
2. Study of different primary tillage implements.
3. Study of different secondary tillage implements.
4. Study of interculturing farm implements and practice.
5. Study of practice of puddling in paddy cultivation.
6. Study of seeding implements.
7. Study of Different Methods of Sowing.
8. Methods of preparing composts and farmyard manure.
9. Study of green manuring and its preparation.
10. Identification and classification of manures and fertilizers.
11. Study of preparation of fertilizer mixtures and unit cost of fertilizers.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	A Practical manual of principles of Agronomy	S R Reddy	Kalyani Publishers

Course Code	AGR 108
Course Title	General Horticulture Lab
Type of course	Practical
L T P	2 0 0
Credits	1 0 0

GENERAL HORTICULTURE LAB

Practical

1. Study of Garden tools, implements and plant protection equipments.
2. Study of Orchards planning and layout.
3. Study of Training and pruning of orchard trees.
4. Study of manures and fertilizers
5. Study of Identification and management of nutritional deficiency disorders in horticultural crops.
6. Study of maturity indices, harvesting, grading and packing of horticultural crops .
7. Study of on preparation and application of growth regulators in horticulture
8. Study on Layout of different irrigation systems.
9. Study of Pots, potting and repotting

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Practical manual of fundamentals of horticulture and production technology of fruit crops	Dr. B Hemla Naik	College of Agriculture, Shimoga

Course Code	AGR 112
Course Title	Elementary Biochemistry Lab
Type of course	Practical
L T P	4 0 0
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course Objective (CO)	To become aware of different Quantitative test, extraction and estimation of different biochemical.

ELEMENTARY BIOCHEMISTRY LAB

Practical

1. Preparation of standard solutions and buffer solutions.
2. Determination of pH.
3. Qualitative test of carbohydrates
4. Qualitative test for lipids.
5. Qualitative test for amino acids and proteins
6. Quantitative estimation of sugars
7. Quantitative estimation of amino acids
8. Quantitative estimation of proteins.
9. Estimation of phenols
10. Identification of plant pigments by paper chromatography.
11. Thin layer chromatography of lipids
12. Demonstration of column chromatography
13. Extraction of oil from oil seeds
14. Extraction of nucleic acids
15. Effect of ph on enzyme activity

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Biochemistry & Biotechnology - A Laboratory Manual,	Yadav VK & Yadav N	Pointer Publisher
2	Introductory practical Biochemistry	Sahney SK and Singh RR	Narosa publishing house, New Delhi

Course Code	BOT 104
Course Title	Plant Physiology Lab
Type of course	Practical
L T P	2 0 0
Credits	1 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	To become aware of different, extraction, estimation and measurement of different pigments, water, transpiration etc.

PLANT PHYSIOLOGY LAB

Practical

1. Preparation of solutions
2. Growth analysis: Calculation of growth parameters
3. Methods of measuring water status in roots, stems and leaves.
4. Measurement of water potential by Chardakov's method.
5. Measurement of absorption spectrum of chloroplastic pigments and fluorescence.
6. Measurement of leaf area by various methods.
7. Stomatal frequency and index.
8. Respirometer – Measurement of respirometer.
9. Leaf anatomy of C3 and C4 plants.
10. Transpiration of measurement
11. Imbibition of seed.
12. Optimum conditions for seed germination.
13. Breaking seed dormancy (a) Chemical method (b) Mechanical method.
14. Yield analysis.
15. Seed viability and vigour tests.
16. Effect of ethylene on regulation of stomata.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Plant Physiology	H N Srivastava	Pradeep Publishers

Semester III

Course Code	AGR208
Course Title	Crop Production Technology – I (Kharif Crops)
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to know about the kharif crops and their cultivation techniques

Crop Production Technology-I (Kharif Crops)

Theory

UNIT-I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops.

UNIT-II

Cereals – rice, maize, sorghum, pearl millet and finger millet.

UNIT-III

Pulses- pigeon pea, mung bean and urd bean; Oilseeds- groundnut, and soybean.

UNIT-IV

Fiber crops- cotton & jute; forage crops- sorghum, cowpea, cluster bean and napier.

Practical

1. Rice nursery preparation, transplanting of rice.
2. Sowing of soybean, pigeon pea and mung bean, maize, groundnut and cotton.
3. Effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops.
4. Identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm.

5. Study of forage experiments, morphological description of kharif season crops, visit to research centres of related crops.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Principles of Crop Husbandary	S R Reddy	Kalyani Publishers Ludhiana
2	Package of Practices for Kharif Crops	PAU	PAU Publications Ludhiana

Course Code	AGR203
Course Title	Fundamentals of Plant Breeding
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the basic of plant breeding

Fundamentals of Plant Breeding

Theory

UNIT-I

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options.

UNIT-II

Domestication, Acclimatization and Introduction; Centers of origin/ diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept.

UNIT-III

Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes, Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization

UNIT-IV

Maintenance of breeding records and data collection; Wide hybridization and prebreeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and Farmer's Rights.

Practical

1. Plant Breeder's kit, Study of germplasm of various crops.
2. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops.
3. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregation populations.
4. Methods of calculating mean, range, variance, standard deviation, heritability.
5. Designs used in plant breeding experiments, analysis of Randomized Block Design.
6. To work out the mode of pollination in a given crop and extent of natural out-crossing.
7. Prediction of performance of double cross hybrids.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Plant Breeding	Singh, B.D.	Kalyani publishers, New Delhi
2	Essentials of plant breeding	Singh, P	Kalyani publishers, New Delhi

Course Code	AGR205
Course Title	Agricultural Finance and Cooperation
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the financial conditions and different types of cooperation

Agricultural Finance and Co-Operation

Theory

UNIT-I

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits.

UNIT-II

Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost.

UNIT-III

An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

UNIT-IV

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practical

1. Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise.
2. Analysis of progress and performance of cooperatives using published data.
3. Analysis of progress and performance of commercial banks and RRBs using published data.
4. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures.
5. Estimation of credit requirement of farm business – A case study.
6. Preparation and analysis of balance sheet – A case study.
7. Preparation and analysis of income statement – A case study.
8. Appraisal of a loan proposal – A case study.
9. Techno-economic parameters for preparation of projects.
10. Preparation of Bankable projects for various agricultural products and its value added products.
11. Seminar on selected topics.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Agricultural Economics	Lekhi, R.K. and Singh, J	Kalyani publishers, Ludhiana
2	Principles and methods of farm management	Tandon, P.K. and Dhandyal, S.P	Kalyani publishers, Ludhiana,

Course Code	AGR207
Course Title	Agri-Informatics
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of the Agri-Informatics subject is to introduce the students to uses of information technology in agriculture sciences.

Agri-Informatics

Theory

UNIT-I

Introduction to Computers, Operating Systems, definition and types, Applications of MSOffice for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions.

UNIT-II

Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations. e-Agriculture, concepts and applications, Use of ICT in Agriculture.

UNIT-III

Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc.

UNIT-IV

Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc. for supporting Farm decisions. Preparation of contingent crop-planning

using IT tools.

Practical

1. Study of Computer Components, accessories, practice of important DOS Commands.
2. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management.
3. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific document.
4. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.
5. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
6. Introduction to World Wide Web (WWW). Introduction of programming languages.
7. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost;
8. Computation of water and nutrient requirements of crop using CSM and IT tools.
9. Introduction of Geospatial Technology for generating valuable information for Agriculture.
10. Hands on Decision Support System. Preparation of contingent crop planning.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Computer Fundamentals	B. Ram	
2	Computers Today	Basandra	
3	Agro-informatics	G. Vanitha	New India Publishing Agency

Course Code	AGR209
Course Title	Farm Machinery and Power
Type of course	Theory & Practicals
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the machinery and power unutilized in the farm.

Farm Machinery and Power

Theory

UNIT-I

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles

of I C engines, comparison of two stroke and four stroke cycle engines.

UNIT-II

Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines.

UNIT-III

Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system: clutch, gear box, differential and final drive of a tractor, Tractor types, Cost analysis of tractor power and attached implement.

UNIT-IV

Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practical

1. Study of different components of I.C. engine.
2. To study air cleaning and cooling system of engine.
3. Familiarization with clutch, transmission, differential and final drive of a tractor.
4. Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine.
5. Learning of tractor driving, Familiarization with operation of power tiller.
6. Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow.
7. Familiarization with seedcum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter.
8. Familiarization with different types of sprayers and dusters.
9. Familiarization with different intercultivation equipment,
10. Familiarization with harvesting and threshing machinery.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Farm Power and Machinery Management Vol - 1	D. N & S Mukesh Sharma	Asha Book House

2	Farm Power and Machinery	ICAR ECourse Pdf book	ICAR (Agrimoon.com)

Course Code	AGR211
Course Title	Production Technology for Vegetables and Spices
Type of course	Theory & Practicals
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject to know about the production technology for vegetables and species

Production Technology for Vegetable and Spices

Theory

UNIT-I

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices.

UNIT-II

Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol.

UNIT-III

Bulb crops such as Onion, Garlic; Root crops such as Carrot, Radish, Beetroot

UNIT-IV

Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables.

Practical

1. Identification of vegetables & spice crops and their seeds.
2. Nursery raising. Direct seed sowing and transplanting.
3. Study of morphological characters of different vegetables & spices.
4. Fertilizers applications.

5. Harvesting & preparation for market.
6. Economics of vegetables and spices cultivation.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Handbook of vegetable crops	Dhaliwal M.S	Kalyani Publishers. Ludhiana
2	Vegetable crops of India,	Das , P.C.,	Kalyani Publishers Ludhiana
3	Food Science	Potter, N.N	AVI Publishing Company, Connecticut.

Course Code	AGR213
Course Title	Environmental Studies and Disaster Management
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about Environmental Studies and Disaster Management

Environmental Studies and Disaster Management

Theory

UNIT-I

Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. •

Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

UNIT-II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

UNIT-III

Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation.

Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

UNIT-IV

Disaster Management

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building free, coal free, forest free, oil free, air

pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

Disaster Management- Effect to migrate natural disaster at national and global levels.

International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

1. Pollution case studies. Case Studies- Field work:
2. Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain,
3. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural,
4. Study of common plants, insects, birds and study of simple ecosystems-pond, river,hill slopes, etc.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Environment Education and Disaster Management	V D Harma	CBS Publisher and Distributors, New Delhi
2	Environment Engineering and Disaster Management	Sanjay K Sharma	Laxmi Publisher

Course Code	MAT209
Course Title	Statistical Methods
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to acquaint the students about the statistical methods used in the analysis of crops data

Statistical Methods

Theory

UNIT-I

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion.

UNIT-II

Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation.

UNIT-III

Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table.

UNIT-IV

Introduction to Analysis of Variance, Analysis of One Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

1. Graphical Representation of Data.
2. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles.
3. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles.
4. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data).
5. Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data).
6. Correlation & Regression Analysis.
7. Application of One Sample t-test. Application of Two Sample Fisher's t-test.
8. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2×2 contingency table.
9. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification.
10. Selection of random sample using Simple Random Sampling

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Statistical Methods	S P Gupta	S Chand
2	Fundamentals of	S C Gupta and V K	Pearson Education

	Mathematical Statistics	Kapoor	
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Course Code	AGR215
Course Title	Livestock and Poultry Management
Type of course	Theory & Practical
L T P	3 0 1
Credits	4 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the management of live stocks and poultry

Livestock & Poultry Management

Theory

UNIT I

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals.

UNIT II

Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

UNIT III

Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.1

UNIT IV

Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

1. External body parts of cattle, buffalo, sheep, goat, swine and poultry.
2. Handling and restraining of livestock.
3. Identification methods of farm animals and poultry.
4. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records.

5. Judging of cattle, buffalo and poultry.
6. Culling of livestock and poultry.
7. Planning and layout of housing for different types of livestock. Computation of rations for livestock.
8. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments.
9. Management of chicks, growers and layers.
10. Debeaking, dusting and vaccination.
11. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Handbook of Animal Husbandry	Harbans Singh	ICAR Publications New Delhi
2	Animal Husbandry	Ashok kumar	Discovery Publishing House, New Delhi

Course Code	AGR217
Course Title	Introduction to Forestry
Type of course	Theory and Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to introduce the students about forestry and its importance.

Introduction to Forestry

Theory

UNIT-I

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies.

UNIT-II

Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations.

UNIT-III

Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.

UNIT-IV

Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Practical

1. Identification of tree-species.
2. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.
3. Height measurement of standing trees by shadow method, single pole method and hypsometer.
4. Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques.
5. Forest plantations and their management. Visits of nearby forest based industries.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	A Manual of Indian Forest Botany	Bore, N.L	International Book Dist. New Delhi
2	A Text Book of Silviculture	Diwivedi, A.P	International Book Distributor
3	Forestry Principles and Applications	Antony Joseph Raj and S B Lal	Scientific Publisher
4	Introduction to Forestry and Natural Resources	Donald L. Grebner, Peter Bettinger and Jacek P. Siry	Elsevier

Semester IV

Course Code	AGR202
Course Title	Crop Production Technology-II (Rabi crops)
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this course is to familiarize the students about the rabi crops and their management.

Crop Production Technology-II (Rabi crops)

Theory

UNIT-I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, pulses-chickpea, lentil, peas

UNIT-II

Oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane.

UNIT-III

Medicinal and aromatic crops- mentha, lemon grass and citronella.

UNIT-IV

Forage crops-berseem, Lucerne and oat.

Practical

1. Sowing methods of wheat and sugarcane,
2. Identification of weeds in *rabi* season crops,
3. Study of morphological characteristics of *rabi* crops,
4. Study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane,
5. Study of important agronomic experiments of *rabi* crops at experimental farms.
6. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Principles of Crop Husbandary	S R Reddy	Kalyani Publishers Ludhiana
2	Package of Practices for Rabi Crops	PAU	PAU Publications Ludhiana

Course Code	AGR204
Course Title	Production Technology for Ornamental Crops, MAPs and Landscaping
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the Ornamental Crops, MAPs and their landscaping

Production Technology for Ornamental Crops, MAPs and Landscaping

Theory**UNIT I**

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.

UNIT II

Production technology of important cut flowers like rose, gerbera, carnation, liliium and orchids under protected condition sand gladiolus, tuberose, chrysanthemum under open conditions.

UNIT III

Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.

UNIT IV

Processing and value addition in ornamental crops and MAPs produce.

Practical

1. Identification of Ornamental plants.

2. Identification of Medicinal and Aromatic Plants.
3. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants.
4. Planning and layout of garden. Bed preparation and planting of MAP.
5. Protected structures – care and maintenance. Intercultural operations in flowers and MAP.
6. Harvesting and post-harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Introductory Ornamental Horticulture	Arora, J.S	Kalyani Publishers, Ludhiana
2	Flowers and trees	Randhawa, M.S.,	National book trust-New Delhi

Course Code	AGR206
Course Title	Renewable Energy and Green Technology
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to acquaint the student about renewable Energy and Green Technology

Renewable Energy and Green Technology

Theory

UNIT-I

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application,

UNIT-II

Familiarization with types of biogas plants and gasifiers, biogas, bio alcohol, biodiesel and bio oil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application.

UNIT-III

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application,

UNIT-IV

Introduction of wind energy and their application.

Practical

1. Familiarization with renewable energy gadgets.
2. To study biogas plants,
3. To study gasifier
4. To study the production process of biodiesel,
5. To study briquetting machine,
6. To study the production process of bio-fuels.
7. Familiarization with different solar energy gadgets.
8. To study solar photovoltaic system: solar light, solar pumping, and solar fencing.
9. To study solar cooker.
10. To study solar drying system.
11. To study solar distillation and solar pond.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Energy Technology (Non-Conventional, Renewable and Conventional)	Rao	Khanna
2	Renewable Energy: Power for a Sustainable Future	Boyle	Oxford University Press

Course Code	AGR208
Course Title	Problematic Soils and their Management
Type of course	Theory
L T P	2 0 0
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to understand and solve the problems of soils and their management

Problematic Soils and their Management

Theory

UNIT-I

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.

UNIT-II

Reclamation and management of Saline and sodic soils, Acid soils, Acid sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

UNIT-III

Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.

UNIT-IV

Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Elements of the Nature and Properties of Soils (3rd Edition),	Brady, N. C. and Weil, R. R.,	Pearson Education, New Delhi
2	Properties and Management of Forest Soils	Pritchett and Fisher RF	John Wiley, New York

3	Soil, Plant, Water and Fertilizer Analysis (2nd Edition)	Gupta, P.K.	AGROBIOS, Jodhpur (India)
4	Soil, Plant and Water Analysis (2nd Edition),	Jaiswal, P.C.	Kalyani Publishers, Ludhiana
5	Elements of the Nature and Properties of Soils (3rd Edition),	Brady, N. C. and Weil, R. R.,	Pearson Education, New Delhi.

Course Code	AGR210
Course Title	Production Technology for Fruit and Plantation Crops
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the student about Production Technology for Fruit and Plantation Crops

Production Technology for Fruit and Plantation Crops

Theory

UNIT-I

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits

UNIT-II

Mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond

UNIT-III

Minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry

UNIT-IV

Plantation crops-coconut, areca nut, cashew, tea, coffee & rubber.

Practical

1. Seed propagation. Scarification and stratification of seeds.
2. Propagation methods for fruit and plantation crops.

3. Description and identification of fruit.
4. Preparation of plant bio regulators and their uses.
5. Important pests, diseases and physiological disorders of above fruit and plantation crops.
6. Visit to commercial orchards.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Preservation of fruits and vegetables	Lal, G., Siddappa, S. And Tandon, G.L.	Indian Council of Agricultural Research, New Delhi
2	Fruits	Singh, R	National Book Trust of India, New Delhi
3	Principles of Horticulture.	Adams, C.R. and M. P. Early	Butterworth – Heinemam, Oxford University Press
4	Handbook of Horticulture	Chadha, K.L.	ICAR, New Delhi.

Course Code	AGR212
Course Title	Principles of Seed Technology
Type of course	Theory & Practical
L T P	1 0 2
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of the seed technology subject is to understand the processing, preservation and marketing of different crops

Principles of Seed Technology

Theory

UNIT-I

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality.

UNIT-II

Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification,

phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983.

UNIT-III

Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.

UNIT-IV

Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Practical

1. Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi.
2. Seed production in major pulses: Urd, Mung, Pigeon pea, Lentil, Gram, Field bean, pea.
3. Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard.
4. Seed production in important vegetable crops.
5. Seed sampling and testing: Physical purity, germination, viability, etc.
6. Seed and seedling vigour test.
7. Genetic purity test: Grow out test and electrophoresis.
8. Seed certification: Procedure, Field inspection, Preparation of field inspection report.
9. Visit to seed production farms, seed testing laboratories and seed processing plant.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Seed Technology	R L Aggarwal	Oxford and IBH publications, New Delhi
2	Seed health testing- principal and protocol,	Vishunavat, K	Kalyani Publishers. New Delhi
3	Seed science and technology	Sen Subir, and Ghosh N	Kalyani Publishers. New Delhi

Course Code	AGR214
Course Title	Farming System and Sustainable Agriculture
Type of course	Theory
L T P	1 0 0
Credits	1 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to acquaint the students about different types of farming system and sustainable agriculture.

Farming System and Sustainable Agriculture

Theory

UNIT-I

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance.

UNIT-II

Cropping system and pattern, multiple cropping system, efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system.

UNIT-III

Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability.

UNIT-IV

Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

Recommended Books:

S. No	Name	Author(S)	Publisher
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1	Agricultural Economics	Lekhi, R.K. and Singh, J	Kalyani publishers, Ludhiana
2	Principles and methods of farm management	Tandon, P.K. and Dhandyal, S.P	Kalyani publishers, Ludhiana,
3	Biofertilizers for Sustainable Agriculture.	Sharma, A.K.	Agrobios (India), Jodhpur.
4	Introduction to Soil Microbiology	Alexander, M.	John Wiley & Sons, Inc., New York

Course Code	AGR216
Course Title	Agricultural Marketing, Trade and Prices
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to acquaint the student about the agriculture marketing, trades and prices.

Agricultural Marketing, Trade and Prices

Theory

UNIT-I

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities.

UNIT-II

Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits.

UNIT-III

Marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;

UNIT-IV

Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

1. Plotting and study of demand and supply curves and calculation of elasticities.
2. Study of relationship between market arrivals and prices of some selected commodities.
3. Computation of marketable and marketed surplus of important commodities.
4. Study of price behaviour over time for some selected commodities; Construction of index numbers.
5. Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class.
6. Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning.
7. Application of principles of comparative advantage of international trade.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Agricultural Marketing in India,	Acharya, S.S. and Agrawal, N.L.	Oxford & IBH publishing Co. Pvt Ltd. New Delhi,

2	Agricultural Price Policy in India,	Kahlon, A.S, and Tyagi R.S.	Allied Publishers Private Limited, New Delhi.
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Course Code	AGR218
Course Title	Introductory Agrometeorology & Climate Change
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about agrometeorology and climate change and their impact to the crops.

Introductory Agrometeorology & Climate Change

Theory

UNIT-I

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze.

UNIT-II

Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth.

UNIT-III

Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification.

UNIT-IV

Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normal for crop and livestock production. Weather forecasting- types of weather

forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

1. Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
2. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law.
3. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
4. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
5. Measurement of soil temperature and computation of soil heat flux.
6. Determination of vapor pressure and relative humidity.
7. Determination of dew point temperature.
8. Measurement of atmospheric pressure and analysis of atmospheric conditions.
9. Measurement of wind speed and wind direction, preparation of wind rose.
10. Measurement, tabulation and analysis of rain.
11. Measurement of open pan evaporation and evapotranspiration.
12. Computation of PET and AET

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Fundamentals of Agrometrology and Climate Change	Mahi, G.S. and Kingra, P. K.	Kalyani Publisher
2	Climate Change and Agriculture	G. S. L. H. V. Prasada Rao, G. G. S. N. Rao and V. U. M. Rao	Printice Hall India Learning Private Limited

Course Code	AGR220
Course Title	Introductory Soil and Water Conservation Engineering
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 0 0

Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to introduce the students about soil and water importance to crops

Introductory Soil and Water Conservation Engineering

Theory

UNIT-I

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion.

UNIT-II

Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

UNIT-III

Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design.

UNIT-IV

Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

Practical

1. General status of soil conservation in India.
2. Calculation of erosion index. Estimation of soil loss.
3. Measurement of soil loss.
4. Preparation of contour maps.
5. Design of grassed water ways. Design of contour bunds.
6. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Basic concepts of Soil Science	Kolay, A.K., 1983	Wiley Eastern Ltd., New Delhi
2	Fundamentals of Soil Science (8th Edition)	Foth, H.D., 1991	John Wiley & Sons, New Delhi
3	Introductory Soil Science (3rd Edition)	Das, D .K., 2011	Kalyani publisher, Ludhiana (India).

4	Soil, Plant, Water and Fertilizer Analysis (2nd Edition)	Gupta, P.K. 2009	AGROBIOS, Jodhpur (India).
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Course Code	AGR115-18
Course Title	Human Values & Ethics (non gradial)
Type of course	Theory
L T P	1 0 0
Credits	1 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to develop the ethic and human values inside the students.

Human Value and Ethics

Theory

UNIT-I

Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life.

UNIT-II

Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction

UNIT-III

Decision Making. Motivation, Sensitivity. Success. Selfless Service.

UNIT-IV

Case Study of Ethical Lives. Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Professional Ethics and Human Values	Govindarajan M	Prentice Hall India Learning Private Limited
2	Ethics - Integrity and Aptitude	Santosh Ajmera and Nanda Kishore Reddy	McGraw Hill Education
3	A Textbook On Professional Ethics And Human Values	R.S. Naagarazan	New Age International

Semester V

Course Code	AGR301
Course Title	Principles of Integrated Pest and Disease Management
Type of course	Theory & Practical
L T P	2 0 1
Credits	3(2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this course is to familiarize the students about the pest and disease and their management in the crops

Principles of Integrated Pest and Disease Management

Theory

UNIT-I

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases.

UNIT-II

Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment.

UNIT-III

Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module.

UNIT-IV

Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

Practical

1. Methods of diagnosis and detection of various insect pests, and plant diseases
2. Methods of insect pests and plant disease measurement
3. Assessment of crop yield losses, calculations based on economics of IPM
4. Identification of biocontrol agents, different predators and natural enemies

5. Mass multiplication of Trichoderma, Pseudomonas, Trichogramma, NPV
6. Identification and nature of damage of important insect pests and diseases and their management.
7. Crop (agroecosystem) dynamics of a selected insect pest and diseases.
8. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases .
9. Awareness campaign at farmers fields.

Recommended Books:

S. No.	Name	Author(S)	Publisher
1	Integrated Pest Management -concepts and Approaches	G S Dhaliwal and R Arora	Kalyani
2	Integrated Management of Insects in Stored Products	B Subramanyam and D W Hagstrum	Marcel Dekker
3	Introduction of Insect Pest management	S S Ignacimuthu and S.Jayaraj	Elite, New Delhi

Course Code	AGR303
Course Title	Manures, Fertilizers and Soil Fertility Management
Type of course	Theory
L T P	2 0 1
Credits	3(2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	To introduce basic postulates of soil fertility and nutrient management. Introduction to basic fundamentals of soil fertility and nutrient management.

Manures, Fertilizers and Soil Fertility Management

Theory

UNIT-I

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

UNIT-II

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers
Soil amendments, Fertilizer Storage, Fertilizer Control Order.

UNIT-III

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients.

UNIT-IV

Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

1. Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry.
2. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils.
3. Estimation of soil extractable P in soils.
4. Estimation of exchangeable K; Ca and Mg in soils .
5. Estimation of soil extractable S in soils.
6. Estimation of DTPA extractable Zn in soils.
7. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants.
8. Estimation of S in plants.

Recommended Books:

S. No.	Name	Author(S)	Publisher
1	Manures and Fertilizers	P. C. Das	Kalyani
2	Soil Fertility and fertilizers (5 th ed.)	S. L. Tisdale	Prentice Hall of India Pvt. Ltd
3	Manures and fertilizers	K S Yawalkar	Agriculture-Horticulture Publishing House, Nagpur

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Course Code	AGR305
Course Title	Pests of Crops and Stored Grains and their Management
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to manage pest of crops from stored grains and crops

Pests of Crops and Stored Grains and their Management

Theory

UNIT-I

General account on nature and type of damage by different arthropods pests.

UNIT-II

Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution,

UNIT-III

nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.

UNIT-IV

Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

1. Identification of different types of damage.
2. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops(c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments.
3. Identification of insect pests and Mites associated with stored grain.
4. Determination of insect infestation by different methods. Assessment of losses due to insects.
5. Calculations on the doses of insecticides application technique.
6. Fumigation of grain store / godown.
7. Identification of rodents and rodent control operations in godowns.
8. Identification of birds and bird control operations in godowns.
9. Determination of moisture content of grain. Methods of grain sampling under storage condition.
10. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Insects and Mites of Crops in India	M.R.G.K. Nayar	ICAR, New Delhi
2	A Text Book of Entomology vol.I & II	K.P. Shrivastava	Kalyani Publishers, New Delhi

Course Code	AGR307
Course Title	Diseases of Field & Horticultural Crops & their Management-I
Type of course	Theory & Practical
L T P	2 0 1
Credits	3(2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to acquaint student about the diseases of field and horticultural crops and their management

Diseases of Field & Horticultural Crops & their Management-I

Theory

UNIT-I

Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro

UNIT-II

Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic

UNIT-III

Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight

UNIT-IV

Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

Practical

1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.
2. Field visit for the diagnosis of field problems.
3. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well mounted specimens.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Crop diseases and their management	Y S Ahlawat and S Nagarajan	Kalyani

2	Diseases of Field crops	V K Gupta & Y S Paul	Indus Publishing Co. New Delhi
3	Diseases of Fruit Crops	RS Singh 2012	Oxford and IBH Publishing Co.Pvt.Ltd. New Delhi
4	Diseases of Vegetable Crops 3 rd ed.	R S Singh 1998	Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi

Course Code	AGR309
Course Title	Crop Improvement – I (Kharif crops)
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the student about the improvement of the kharif crops

Crop Improvement – I (Kharif crops)

Theory

UNIT-I

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops

UNIT-II

Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops

UNIT-III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)

UNIT-IV

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

1. Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Maize,
2. Floral biology, emasculation and hybridization techniques in different crop species; viz Sorghum, Pearl millet
3. Floral biology, emasculation and hybridization techniques in different crop species; viz Ragi, Pigeonpea, Urdbean, Mungbean,
4. Floral biology, emasculation and hybridization techniques in different crop species; viz Soybean, Groundnut, Sesame, Caster, Cotton,
5. Floral biology, emasculation and hybridization techniques in different crop species; viz Cowpea, Jute, Tobacco, Brinjal, Okra and Cucurbitaceous crops.
6. Maintenance breeding of different kharif crops.
7. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods;
8. Study of field techniques for seed production and hybrid seeds production in Kharif crops;
9. Estimation of heterosis, inbreeding depression and heritability;
10. Layout of field experiments;
11. Study of quality characters, donor parents for different characters;
12. Visit to seed production plots; Visit to AICRP plots of different field crops.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Crop Improvement: Challenges in the Twenty-first century (Edt.)	Manjit S. Kang	International Book Distributing Co. Lukhnow
2	Breeding Technology of Crop Plants (Edt.).	A.K. Sharma	Yash Publishing House, Bikaner

Course Code	AGR311
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Course Title	Entrepreneurship Development and Business Communication
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective this subject is to build the possibility of entrepreneurship development and business communication so that he can take bold decision and become self-reliant

Entrepreneurship Development and Business Communication

Theory

UNIT-I

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development,

UNIT-II

Impact of economic reforms on Agribusiness/ Agri enterprises, Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation)

UNIT-III

Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill

UNIT-IV

Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri entrepreneurship and rural enterprise.

Practical

1. Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation
2. Exercise in creativity, time audit through planning, monitoring and supervision
3. Identification and selection of business idea
4. preparation of business plan and proposal writing

5. visit to entrepreneurship development institute and entrepreneurs

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Entrepreneurship Development and Communication skills	R. R. Chole and P.S. Kapse	Scientific Publishers (India) Jodhpur
2	A text book of Agricultural Extension Management	C Karthikeyan <i>et al</i>	Atlantic Publishers, New Delhi

Course Code	AGR313
Course Title	Geoinformatics, Nano-technology and Precision Farming
Type of course	Theory
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is familiarize the student about the latest technology of geo information, nanotechnology and precision farming

Geoinformatics, Nano-technology and Precision Farming

Theory

UNIT-I

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

UNIT-II

Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture

UNIT-III

Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture

UNIT-IV

Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

1. Introduction to GIS software, spatial data creation and editing.
2. Introduction to image processing software. Visual and digital interpretation of remote sensing images.
3. Generation of spectral profiles of different objects.
4. Supervised and unsupervised classification and acreage estimation.
5. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones.
6. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology.
7. Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture.
8. Projects formulation and execution related to precision farming

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	An introduction to Geo informatics	G.S. Shrivastava 2014	McGraw Hill Education(India)Pvt Ltd.
2	Applied Nanotechnology in Agriculture	S. Choudhary	Arise Publishers & Distributors
3.	Principles of Geo informatics	R K Gupta	Jain Brothers, New Delhi

Course Code	AGR315
Course Title	Practical Crop Production-I (Kharif Crops)
Type of course	Practical
L T P	0 0 2
Credits	2 (0+2)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main of objective of this subject is to give experience of crop production in the field to the students

Practical Crop Production-I (Kharif Crops)

Practical

1. Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management
2. Management of insect-pests diseases of crops, harvesting,
3. Threshing, drying winnowing, storage and marketing of produce.
4. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.

Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Principles and practices of Agronomy	P Subramaniyan	Agribios (India), Jodhpur
2	Manures and Fertilizers (10 th ed.)	K S Yawalkar & J.P. Aggarwal	Agri-Horticultural Publishing House, Nagpur

Course Code	AGR317
Course Title	Intellectual Property Rights
Type of course	Theory
L T P	1 0 0
Credits	1 (1+0)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the technical difficulties in world trades and intellectual property rights followed all over the world

Intellectual Property Rights

Theory

UNIT-I

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

UNIT-II

Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.

Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

UNIT-III

Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.

UNIT-IV

Traditional knowledge-meaning and rights of TK holders. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Law Relating to Intellectual Property Rights	V K Ahuja	Jain Book Agency
2	Intellectual Property Rights	Neeraj Pandey and Khushdeep Dharni	UBS

Course Code	AGR319
Course Title	Agricultural Heritage
Type of course	Theory
L T P	1 0 0
Credits	1 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to make the students to understand the agriculture practice and heritage in past, journey of Indian agriculture from past to modern era.

Agricultural Heritage

Theory

UNIT-I

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture;

UNIT-II

Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era;

UNIT-III

Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India;

UNIT-IV

Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Ancient and Medieval History of Indian Agriculture	Choudhary, S.L., Sharma, G.S. and Nene, Y.L.	Rajasthan College of Agriculture, Udaipur
2	Principles & Practices of Agronomy	S S Singh	Kalyani Publishers
3	Handbook of Agriculture	ICAR	ICAR New Delhi

Semester VI

Course Code	AGR302
Course Title	Rainfed Agriculture and Watershed Management
Type of course	Theory & Practical
L T P	1 0 1
Credits	2(1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is familiarize the student about rainfed agriculture and watershed management

Rainfed Agriculture and Watershed Management

Theory

UNIT-I

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India

UNIT-II

Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought

UNIT-III

Water harvesting: importance, its techniques, efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas,

UNIT-IV

Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

1. Studies on climate classification,
2. Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.
3. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.
4. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.
5. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation.
6. Studies on cultural practices for mitigating moisture stress.
7. Characterization and delineation of model watershed.
8. Field demonstration on soil & moisture conservation measures.
9. Field demonstration on construction of water harvesting structures.
10. Visit to rainfed research station/watershed

Recommended Books:

S.No.	Name	Author(S)	Publisher
1.	Dryland Agriculture	C Jayanthi & R Kalpana 2016	Kalyani Publishers
2.	Crop Management under Irrigated and Rainfed Conditions	S S Singh	Kalyani Publishers
3.	Sustainable Development of Dryland Agriculture in India	R P Singh	Scientific Publishers, Jodhpur

Course Code	AGR304
Course Title	Protected Cultivation and Secondary Agriculture
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to acquaint students about new technology of protected cultivation to make the agriculture more sustainable

Protected Cultivation and Secondary Agriculture

Theory**UNIT-I**

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment

UNIT-II

Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying.

UNIT-III

Cost estimation and economic analysis. Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.

UNIT-IV

Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

1. Study of different type of green houses based on shape.
2. Determine the rate of air exchange in an active summer winter cooling system.
3. Determination of drying rate of agricultural products inside green house. Study of green house equipments.
4. Visit to various Post Harvest Laboratories.
5. Determination of Moisture content of various grains by oven drying & infrared moisture methods.
6. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).
7. Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Greenhouse Technology- Applications and Practices	A Sharma and V Salokhe	Agro Tech publication,Udaipur
2	Greenhouse: Science and Technology	S.S.Kothari	Himanshu publication, Udaipur

Course Code	AGR306
Course Title	Diseases of Field & Horticultural Crops & their Management-II
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the diseases in fields and horticulture

Diseases of Field & Horticultural Crops & their Management-II

Theory

UNIT-I

Symptoms, etiology, disease cycle and management of following diseases: Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng.

UNIT-II

Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

UNIT-III

Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry: leaf spot.

UNIT-IV

Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

Practical

1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.
2. Field visit for the diagnosis of field problems.
3. Collection and preservation of plant diseased specimens for herbarium.

**Note: Students should submit 50 pressed and well-mounted specimens.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Crop diseases and their management	Y S Ahlawat and S Nagarajan	Kalyani
2	Diseases of Field crops	V K Gupta & Y S Paul	Indus Publishing Co. New Delhi
3	Diseases of Fruit Crops	RS Singh 2012	Oxford and IBH Publishing Co.Pvt.Ltd.

			New Delhi
4	Diseases of Vegetable Crops 3 rd ed.	R S Singh 1998	Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi

Course Code	AGR308
Course Title	Post-harvest Management and Value Addition of Fruits and Vegetables
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the student about the post-harvest management and value addition of fruits and vegetables

Post-harvest Management and Value Addition of Fruits and Vegetables

Theory

UNIT-I

Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post-harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening;

UNIT-II

Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation

UNIT-III

Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning – Concepts and Standards, packaging of products.

Practical

1. Applications of different types of packaging, containers for shelf life extension.
2. Effect of temperature on shelf life and quality of produce.
3. Demonstration of chilling and freezing injury in vegetables and fruits.
4. Extraction and preservation of pulps and juices.
5. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products.
6. Quality evaluation of products -- physico-chemical and sensory.
7. Visit to processing unit/ industry.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Post-harvest Management and Value Addition of Fruits and Vegetables	Asha Kumari	Enkay Publishing House
2	Postharvest Management and processing of Fruits and Vegetables- Instant notes	S K Sharma	New India Publishing Agency

Course Code	AGR310
Course Title	Management of Beneficial Insects
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to learn about the management of beneficial insects by the students

Management of Beneficial Insects

Theory

UNIT-I

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee.

UNIT-II

Role of pollinators in cross pollinated plants. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation

of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.

UNIT-III

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control.

UNIT-IV

Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

Practical

1. Honey bee species, castes of bees.
2. Beekeeping appliances and seasonal management, bee enemies and disease.
3. Bee pasturage, bee foraging and communication.
4. Types of silkworm, voltinism and biology of silkworm.
5. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification.
6. Identification of other important pollinators, weed killers and scavengers.
7. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.
8. Identification and techniques for mass multiplication of natural enemies.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1.	Biological Control by Natural enemies	P. DeBach	Cambridge University Press
2.	Integrated Pest Management: Concepts and approaches	G S Dhaliwal & R. Arora 2001	Kalyani Publishers
3.	A text book of Entomology	K P Shrivastava vol.I	Kalyani Publishers, New Delhi

Course Code	AGR312
Course Title	Crop Improvement – II (Rabi)
Type of course	Theory and Practical
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to learn about the rabi crop improvement

Crop Improvement – II (Rabi)

Theory

UNIT-I

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops

UNIT-II

Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters;

UNIT-III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);

UNIT-IV

Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.

Practical

1. Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion;
2. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods;
3. Study of field techniques for seed production and hybrid seeds production in Rabi crops; Estimation of heterosis, inbreeding depression and heritability;
4. Layout of field experiments; Study of quality characters,

5. Study of donor parents for different characters;
6. Visit to seed production plots; Visit to AICRP plots of different field crops

Recommended Books:

S.No.	Name	Author(S)	Publisher
1.	Biological Control by Natural enemies	P. DeBach	Cambridge University Press
2.	Integrated Pest Management: Concepts and approaches	G S Dhaliwal & R. Arora 2001	Kalyani Publishers
3.	A text book of Entomology	K P Shrivastava vol.I	Kalyani Publishers, New Delhi

Course Code	AGR314
Course Title	Practical Crop Production-II (Rabi Crops)
Type of course	Practical
L T P	0 0 2
Credits	2 (0+2)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to impart practical knowledge of crop production in rabi crops

Practical Crop Production-II (Rabi Crops)

Practical

1. Crop planning, raising field crops in multiple cropping systems:
2. Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce.
3. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.
4. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Crop Improvement: Challenges in the Twenty-first century (Edt.)	Manjit S. Kang	International Book Distributing Co. Lukhnow
2	Breeding Technology of Crop Plants (Edt.).	A.K. Sharma	Yash Publishing House, Bikaner

Course Code	AGR316
Course Title	Principles of Organic Farming
Type of course	Theory & Practical
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main object this subject is to acquaint students about the organic farming and reduce the impact of poisonous and harmful fertilizers and pesticides

Principles of Organic Farming

Theory

UNIT-I

Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture;

UNIT -II

Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming;

UNIT-III

Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP;

UNIT-IV

Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

1. Visit of organic farms to study the various components and their utilization preparation of enrich compost, vermicomposting
2. Preparation of Bio-fertilizers/bio-inoculants and their quality analysis
3. Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system;
4. Post harvest management; Quality aspect, grading, packaging and handling.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Organic Farming for Sustainable Agriculture (2 nd edition)	A K Dharma	Agrobios (India), Jodhpur
2	Organic Farming in India, Problems and Prospects , Agertech	U Thapa and P. Tripathy	Publishing Academy , Udaipur
3.	A Handbook of Organic Farming	Arun K.Sharma	Agrobios(India),Jodhpur

Course Code	AGR318
Course Title	Farm Management, Production and Resource Economics
Type of course	Theory and Practical
L T P	1 0 1
Credits	2 (1+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to make understanding in the students about the farm management, production and resource economics

Farm Management, Production and Resource Economics

Theory

UNIT-I

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms.

UNIT-II

Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product relationship, law

of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income.

UNIT-III

Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.

UNIT-IV

Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical

1. Preparation of farm layout.
2. Determination of cost of fencing of a farm.
3. Computation of depreciation cost of farm assets.
4. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process.
5. Determination of least cost combination of inputs. Selection of most profitable enterprise combination.
6. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.
7. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts.
8. Collection and analysis of data on various resources in India.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Principles and Methods of	R. K. Tandan & S.P.	Kalyani

	Farm Management	Dhondiyal	
2	Fundamental of Farm Business Management	S.S. Johl and T.P. Kapoor	Kalyani

Course Code	AGR320
Course Title	Principles of Food Science and Nutrition
Type of course	Theory
L T P	2 0 0
Credits	2 (2+0)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the principles of food science and nutrition

Principles of Food Science and Nutrition

Theory

UNIT-I

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.).

UNIT-II

Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions).

UNIT-III

Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.)

UNIT-IV

Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.

Recommended Books:

**Scheme of Courses B. Sc. (Hons.) Agriculture
Semester VII**

S. No.	Subject/ Paper Code	Subject Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1	AGR401	General orientation & On campus training by different faculties					
2		Village attachment	0	1	28	28	14
3		Unit attachment in Univ./ College. KVK/ Research Station					

S.No.	Name	Author(S)	Publisher
1	Food Science and Nutrition (second edition)	Sunetra Roday	Oxford
2	Food facts and Principles	N. Shakuntala Manay	New Age

		Attachment					
4	AGR403	Plant clinic	0	1	2	2	2
5	AGR405	Agro-Industrial Attachment	0	1	4	4	4
			0	0	34	34	20

Agro- Industrial Attachment: The students would be attached with the agro-industries for a period of 3 weeks to get an experience of the industrial environment and working. Educational tour will be conducted in break between IV & V Semester or VI & VII Semester

RAWE Component-I

Village Attachment Training Programme

Sl. No.	Activity	Duration
1	Orientation and Survey of Village	1 week
2	Agronomical Interventions	1 week
3	Plant Protection Interventions	1 week
4	Soil Improvement Interventions (Soil sampling and testing)	1 week
5	Fruit and Vegetable production interventions	1 week
6	Food Processing and Storage interventions	1 week
7	Animal Production Interventions	1 week
8	Extension and Transfer of Technology activities	1 week

RAWE Component –II

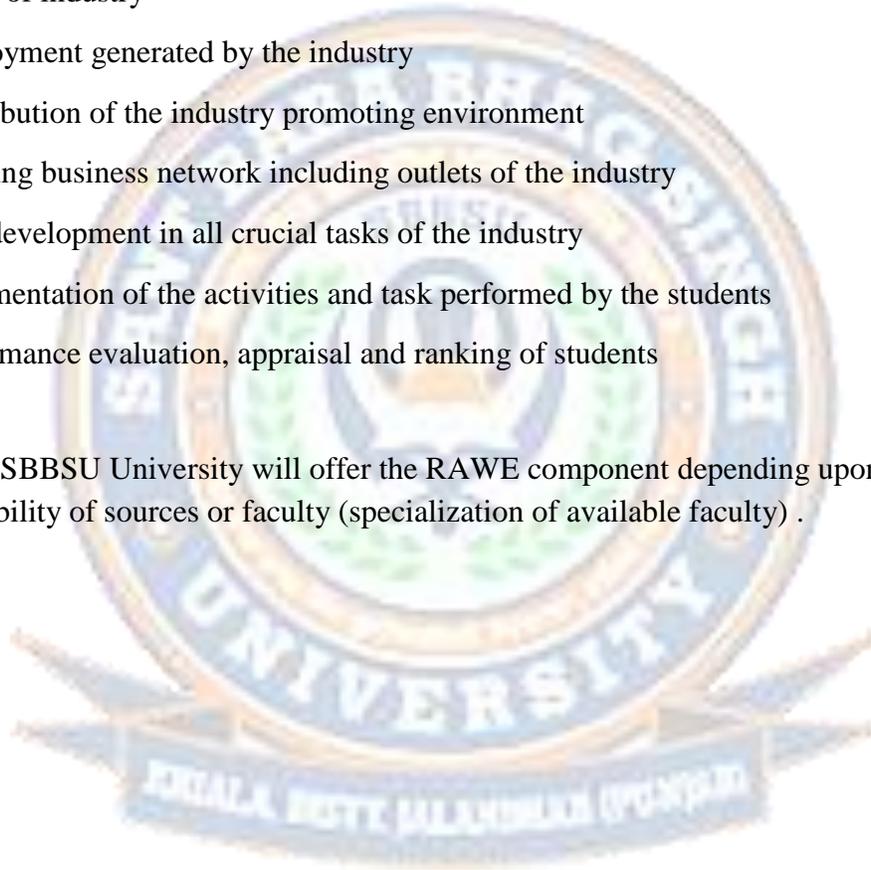
Agro Industrial Attachment y Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.

Industries include Seed/Sapling production, Pesticides-insecticides, Post harvest-processing value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

- Acquaintance with industry and staff
- Study of structure, functioning, objective and mandates of the industry
- Study of various processing units and hands-on trainings under supervision of industry staff
- Ethics of industry
- Employment generated by the industry
- Contribution of the industry promoting environment
- Learning business network including outlets of the industry
- Skill development in all crucial tasks of the industry
- Documentation of the activities and task performed by the students
- Performance evaluation, appraisal and ranking of students

➤ **Note:** SBBSU University will offer the RAWE component depending upon the availability of sources or faculty (specialization of available faculty) .



Scheme of Courses B. Sc. (Hons.) Agriculture
Semester VIII

Students of Semester VIII (applicable for admission in 2017, batch 2017-2021) will also study the three courses (C-1, C-2 and C-3) not studied earlier in First year (as per 5th Deans' Committee Report) along with optional following 2 modules.

Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the **VIII semester**.

- **Note:** SBBSU University will offer the modules depending upon the availability of sources/ faculty (specialization of available faculty) .

S. No.	Subject/ Paper Code	Subject/Module Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
C-1	AGR402	Principles of Biotechnology	1	0	2	3	2 (1+1)
C-2	AGR404	Fundamentals of Soil Sciences	2	0	2	4	3 (2+1)
C-3	AGR406	Agricultural Extension	2	0	2	4	3 (2+1)
S. No.	Subject/ Paper Code	Subject/Module Name	Contact Hours (Lecture)	Contact Hours (Tutorial)	Contact Hours (Practical)	Total Contact Hours	Total Credit Hours
1	AGR408	Production Technology for Bioagents and Biofertilizer	0	1	20	20	0+10
2	AGR410	Seed Production and Technology	0	1	20	20	0+10
3	AGR412	Mushroom Cultivation Technology	0	1	20	20	0+10
4	AGR414	Soil, Plant, Water and Seed Testing	0	1	20	20	0+10
5	AGR416	Commercial Beekeeping	0	1	20	20	0+10
6	AGR418	Poultry Production Technology	0	1	20	20	0+10
7	AGR420	Commercial Horticulture	0	1	20	20	0+10
8	AGR422	Floriculture and Landscaping	0	1	20	20	0+10
9	AGR424	Food Processing	0	1	20	20	0+10

10	AGR426	Agriculture Waste Management	0	1	20	20	0+10
11	AGR428	Organic Production Technology	0	1	20	20	0+10
12	AGR430	Commercial Sericulture	0	1	20	20	0+10

Total Credit Hours: 28
(8 credits from C-1, C-2 and C-3 + 20 credits from Module)

Sl. No.	Title of the module	Credits
1	Production Technology for Bioagents and Biofertilizer	0+10
2	Seed Production and Technology	0+10
3	Mushroom Cultivation Technology	0+10
4	Soil, Plant, Water and Seed Testing	0+10
5	Commercial Beekeeping	0+10
6	Poultry Production Technology	0+10
7	Commercial Horticulture	0+10
8	Floriculture and Landscaping	0+10
9	Food Processing	0+10
10	Agriculture Waste Management	0+10

11	Organic Production Technology	0+10
12	Commercial Sericulture	0+10

NOTE: In addition to above ELP modules other important modules may be given to the students by SAUs

Evaluation of Experiential Learning Programme/ HOT

S.No.	Parameters	Max. Marks
1.	Project Planning and Writing	10
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
5	Output delivery	10
6.	Technical Skill Development	10
7.	Entrepreneurship Skills	10
8.	Business networking skills	10
9.	Report Writing Skills	10
10	Final Presentation	10
	Total	100

SYLLABUS OF ELECTIVE COURSES

A student can select one elective courses out of the following and offer each during 4th, 5th and 6th semesters.

NOTE: The Student of 6th semester should prefer 2+1 course (3 credits course).

Course Code	AGR220
Course Title	Commercial Plant Breeding
Type of course	Theory & Practical
L T P	1 0 2
Credits	3 (1+2)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent

Course objective	Main objective of this subject is to familiarize the student about the commercial plant breeding techniques which are used to produce new high yielding varieties by the industries
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Commercial Plant Breeding

Theory

UNIT-I

Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.

UNIT-II

Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc.

UNIT-III

Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.

UNIT-IV

IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical

1. Floral biology in self and cross pollinated species, selfing and crossing techniques.
2. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system.
3. Learning techniques in hybrid seed production using male-sterility in field crops.
4. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production.
5. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production.

6. Role of pollinators in hybrid seed production.
7. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops.
8. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management.
9. Screening techniques during seed processing viz., grading and packaging.
10. Visit to public private seed production and processing plants.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Plant Breeding	Singh, B.D	Kalyani Publishers. New Delhi
2	Principles of Plant Genetics and Breeding (Second Edition)	George Acquaah	John Wiley & Sons Ltd.

Course Code	AGR222
Course Title	Biopesticides & Biofertilizers
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objectives of this subject is to familiarize the students about the biopesticides and biofertilizers which are free from harmful chemicals and more environment friendly and future of the crop production

Biopesticides & Biofertilizers

Theory

UNIT-I

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and bio rationales. Botanicals and their uses.

UNIT-II

Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticides.

UNIT-III

Bio fertilizers - Introduction, status and scope. Structure and characteristic features of bacterial bio fertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*; Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.

UNIT-IV

Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Bio fertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of bio fertilizers.

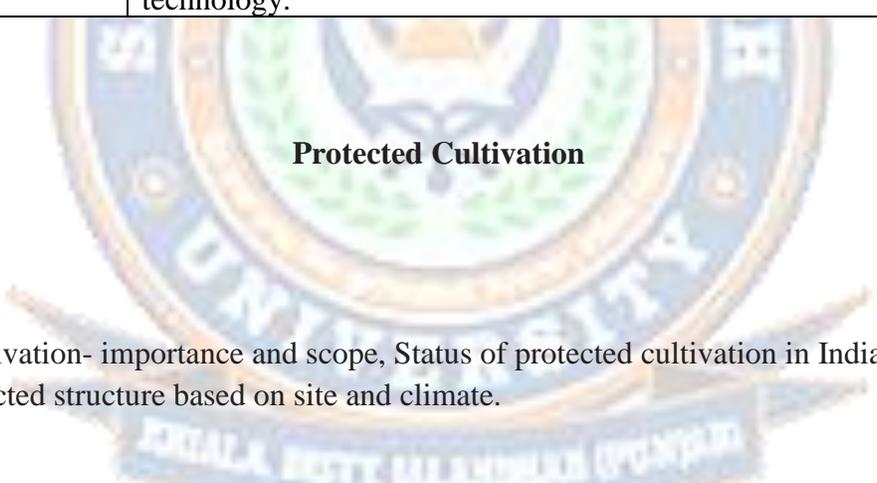
Practicals

1. Isolation and purification of important biopesticides: *Trichoderma*, *Pseudomonas*, *Bacillus*, *Metarhizium* etc. and its production.
2. Identification of important botanicals.
3. Visit to biopesticides laboratory in nearby area.
4. Field visit to explore naturally infected cadavers.
5. Identification of entomopathogenic entities in field condition.
6. Quality control of biopesticides.
7. Isolation and purification of *Azospirillum*, *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria.
8. Mass multiplication and inoculums production of bio fertilizers.
9. Isolation of AM fungi -Wet sieving method and sucrose gradient method.
10. Mass production of AM inoculants.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Biofertilizers and Biopesticides	Channabasava A and Lakshman, H. C.	Pointers Publishers
2	Biofertilizers and Biopesticides	Shalini Suri	Aph Publishing Corporation

Course Code	AGR224
Course Title	Protected Cultivation
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to let student learn about protected farming to produce cash and medicinal crops with new and advanced technology.



Protected Cultivation

Theory

UNIT-I

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate.

UNIT-II

Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, Portrays lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers.

UNIT-III

Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

UNIT-IV

Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Practical

1. Raising of seedlings and saplings under protected conditions, use of Portrays in quality planting material production,
2. Bed preparation and planting of crop for production,
3. Inter cultural operations, Soil EC and pH measurement,
4. Regulation of irrigation and fertilizers through drip, fogging ad misting.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Greenhouse Technology- Applications and Practices	A Sharma and V Salokhe	Agro Tech publication, Udaipur
2	Greenhouse: Science and Technology	S.S.Kothari	Himanshu publication, Udaipur
3	Protected Cultivation of Vegetables Crops	Balraj Singh	Kalyani Publishers
4	Protected Cultivation of Horticultural Crops	D K Singh and K V Peter	New India Publishing Agency

Course Code	AGR226
Course Title	Micro propagation Technologies
Type of course	Theory & Practical
L T P	3 0 2
Credits	3 (1+2)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to learn about the tissue culture and micro propagation technology

Micro propagation Technologies

Theory

UNIT-I

Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell),

UNIT-II

Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture),

UNIT-III

Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures,

UNIT-IV

Production of secondary metabolites, Somaclonal variation, Cryopreservation

Practical

1. Identification and use of equipments in tissue culture Laboratory,
2. Nutrition media composition, sterilization techniques for media, containers and small instruments,
3. Sterilization techniques for explants, Preparation of stocks and working solution, Preparation of working medium,
4. Culturing of explants: Seeds, shoot tip and single node, Callus induction,
5. Induction of somatic embryos regeneration of whole plants from different explants,
6. Hardening procedures.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Plant Tissue Culture	S Kumar	Scientific Publishers Journals Dept
2	Introduction to plant tissue culture	M K Razdan	Science Pub Inc

Course Code	AGR319
Course Title	Hi-tech. Horticulture
Type of course	Theory & Practical

L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to introduce the students about latest technology in the field of horticulture.

Hi-tech. Horticulture

Theory

UNIT-I

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops.

UNIT-II

Modern field preparation and planting methods, protected cultivation: advantages, controlled conditions, method and techniques.

UNIT-III

Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding.

UNIT-IV

Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical

1. Types of polyhouses and shade net houses,
2. Intercultural operations, tools and equipments identification and application,
3. Micro propagation,
4. Nursery-protrays, micro-irrigation,
5. EC, pH based fertilizer scheduling,
6. Canopy management,
7. Visit to hi-tech orchard/nursery.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Hi Tech Horticulture	S Parsad, Dharam Singh and B L Bhardwaj	Agro Bios
2	Greenhouse Management for Horticulture Crops	S Prasad and U Kumar	Agro Bios

Course Code	AGR321
Course Title	Weed Management
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to let learn the student about the management of weeds with different technique

Weed Management

Theory

UNIT-I

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.

UNIT-II

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.

UNIT-III

Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application.

UNIT-IV

Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Practical

1. Techniques of weed preservation. Weed identification and their losses study.
2. Biology of important weeds.

3. Study of herbicide formulations and mixture of herbicide.
4. Herbicide and agrochemicals study.
5. Shift of weed flora study in long term experiments.
6. Study of methods of herbicide application, spraying equipments.
7. Calculations of herbicide doses and weed control efficiency and weed index.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	A Text Book of Weed Management	B L Jana	Pointer
2	Weed Management	R K Pawar	ABD Publisher

Course Code	AGR323
Course Title	System Simulation and Agroadvisory
Type of course	Theory
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to introduce the students about the system simulation and agro advisory which helps the farmer about the early warning about the disease and climate and let the farmer ready reduces the losses

System Simulation and Agroadvisory

Theory

UNIT-I

System Approach for representing soil-plant-atmospheric continuum, system boundaries.

UNIT-II

Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams. Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis.

UNIT-III

Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance.

UNIT-IV

Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

1. Preparation of crop weather calendars.
2. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts.
3. Working with statistical and simulation models for crop growth.
4. Potential & achievable production; yield forecasting, insect & disease forecasting models.
5. Simulation with limitations of water and nutrient management options.
6. Sensitivity analysis of varying weather and crop management practices.
7. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.
8. Feedback from farmers about the agro-advisory

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Fundamentals of Agro-metrology and Climate Change	Mahi, G.S. and Kingra, P. K.	Kalyani Publisher
2	Climate Change and Agriculture	G. S. L. H. V. Prasada Rao, G. G. S. N. Rao and V. U. M. Rao	Printice Hall India Learning Private Limited
3	A text book on Agricultural Meteorology	Ram Nivas, Surender Singh, Diwan Singh, Khichar MI and Raj Singh	CCS, HAU, Hissar

Course Code	AGR325
Course Title	Agricultural Journalism
Type of course	Theory & Practical

L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to acquaint the students about the agriculture journalism

Agricultural Journalism

Theory

UNIT-I

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

UNIT-II

Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.

UNIT-III

The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.

UNIT-IV

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

Practical

1. Practice in interviewing.
2. Covering agricultural events.
3. Abstracting stories from research and scientific materials and from wire services.
4. Writing different types of agricultural stories.

5. Selecting pictures and artwork for the agricultural story.
6. Practice in editing, copy reading, headline and title writing, proofreading, lay outting.
7. Testing copy with a readability formula.
8. Visit to a publishing office.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Agricultural Journalism	B L Jana	ATPA
2	Farm Journalism and Media Management	C Bhaskaran	Agrotech publishing Academy

Course Code	AGR322
Course Title	Agribusiness Management
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the student about the agri business management which enables him to set commercial agribusiness of big farms

Agribusiness Management

Theory

UNIT-I

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy.

UNIT-II

Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding and support primary activities and their linkages.

UNIT-III

Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control.

UNIT-IV

Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

1. Study of agri-input markets: Seed, fertilizers, pesticides.
2. Study of output markets: grains, fruits, vegetables, flowers.
3. Study of product markets, retails trade commodity trading, and value added products.
4. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD.
5. Preparations of projects and Feasibility reports for agribusiness entrepreneur.
6. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques.
7. Case study of agro-based industries.
8. Trend and growth rate of prices of agricultural commodities.
9. Net present worth technique for selection of viable project.
10. Internal rate of return.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Agribusiness Management	Freddie L. Barnard,	Routledge

		Jay T. Akridge and Frank J. Dooley	
2	Principles of agribusiness management	James G Beierlein	Waveland Press

Course Code	AGR324
Course Title	Agrochemicals
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is familiarize the students about the different types of agro chemicals used in the form of insecticides, pesticides and fertilizers

Agrochemicals

Theory

UNIT-I

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.

UNIT-II

Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action-Dithiocarbamates-characteristics, preparation and use of Zineb and maneb. Systemic fungicides-Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.

UNIT-III

Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

UNIT-IV

Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

1. Sampling of fertilizers and pesticides.
2. Pesticides application technology to study about various pesticides appliances.
3. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer.
4. Calculation of doses of insecticides to be used.
5. To study and identify various formulations of insecticide available in market. Estimation of nitrogen in Urea.
6. Estimation of water soluble P₂O₅ and citrate soluble P₂O₅ in single super phosphate.
7. Estimation of potassium in Muriate of Potash/ Sulphate of Potash by flame photometer.
8. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide.
9. Determination of thiram. Determination of ziram content.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Agro Chemical Industries	EIRI	
2	Manures, Fertilizers and Agrochemicals	Esource ICAR	ICAr

Course Code	AGR326
Course Title	Landscaping
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2+1)

Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	The main objective of this subject is to know about the landscaping

Landscaping

Theory

UNIT-I

Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.

UNIT-II

Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture.

UNIT-III

Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management.

UNIT-IV

Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

1. Identification of trees, shrubs, annuals, pot plants;
2. Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting,
3. Identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance,
4. layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house.
5. Use of computer software, visit to important gardens/ parks/ institutes.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Garden Design and Landscaping	Rachel Mathews	Successful garden Design
2	Introductory Ornamental Horticulture	Arora, J.S	Kalyani Publishers, Ludhiana
3	Flowers and trees	Randhawa, M.S.,	National book trust-New Delhi

Course Code	AGR328
Course Title	Food Safety and Standards
Type of course	Theory & Practicals
L T P	2 0 1
Credits	3 (2+1)
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	Main objective of this subject is to familiarize the students about the food safety and standards

Food Safety and Standards

Theory

UNIT-I

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control.

UNIT-II

Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene.

UNIT-III

Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.

UNIT-IV

Food laws and Standards Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

1. Water quality analysis physico-chemical and microbiological.
2. Preparation of different types of media. Microbiological Examination of different food samples. Assessment of surface sanitation by swab/rinse method.
3. Assessment of personal hygiene.
4. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	The Food Safety and Standard Act 2006	A Sharma and V Salokhe	Commercial law Publishers
2	Food Safety and Standard Act, Rules and Regulation	Kumar Jain and Vidhi Jain	Akalank Publications