POST GRADUATE DEPARTMENT OF AGRICULTURE

SYLLABUS FOR THE BATCH FROM THE YEAR 2022 TO YEAR 2026

Programme Code: BHAG-1931

Programme Name: B.Sc. (Hons.) Agriculture.

(Semester I-VIII)

Examinations: (2022-23)

Khalsa College Amritsar

Programme Objectives (POs) of B.Sc. (Hons.) Agriculture

PO-1: To sensitize and provide information about sustainable use of natural source techniques through course curriculum.

PO-2: To provide in-depth knowledge to students about various ways of improving agriculture.

PO-3: To develop the skills of problem solving, leadership and professional engagement in agriculture and allied science.

PO-4: To produce highly skilled professionals in field of various branches of agriculture to meet the need of various scientific agriculture institutions, private organization, agro based industries as well as farmers demand for agriculture professionals.

B.Sc. (Hons.) Agriculture.

B.SC. (HONS.) AGRICULTURE

Program Specific Outcomes (PSOs) & COURSE OUTCOMES

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO-1	To disseminate ancient agricultural practices to modern agriculture
PSO-2	To impart in-depth practical knowledge about a package of practices for agronomic and horticultural crops and economic forest trees.
PSO-3	To provide knowledge on working of different farm implements and plant protection equipments.
PSO-4	To serve the rural agricultural population through dissemination and adoption of recent agricultural innovations.
PSO-5	Detailed knowledge on various agro-based businesses, farm management, various marketing strategies and finance management
PSO-6	To provide knowledge about processing of horticultural, food and forage crops.
PSO-7	To get detailed knowledge on the weather system, relationship of weather with crops and insect-pests and diseases.
PSO-8	To provide knowledge on precision farming, use of GIS, GPS in Agriculture, Sustainable agricultural practices and organic farming
PSO-9	To understand the basic morphology, physiology, classification, biology and nature of damage of different insect-pests, diseases and viruses.
PSO-10	To acquaint students with the role of mathematics and statistics in agriculture, economics and allied sciences.
PSO-11	To make the student entrepreneur in different agricultural fields like mushroom cultivation, agrochemicals, beekeeping, dairy, food processing and organic production of crops.
PSO-12	To understand genetic variation among various crops and their application in agriculture.
PSO-13	To develop communication, presentation and demonstration skills.

B.Sc. (Hons.) Agriculture.

SEMESTER-I

Course Code	Subject	Credit hours per week	Marks Distribution	Maximum Marks
		(Th+Prac)	Th.+Prac+I.A	
MBL- 111	Agricultural Microbiology	2 (1+1)	50+25+25	100
PBG-112	Fundamentals of Genetics	3 (2+1)	50+25+25	100
SSC-113	Fundamentals of Soil Science	3 (2+1)	50+25+25	100
FOR-114	Introduction to Forestry	2 (1+1)	50+25+25	100
AGR-115	Fundamentals of Agronomy	4 (3+1)	50+25+25	100
EXT-116	Rural Sociology and Educational Psychology	2 (2+0)	75+0+25	100
**BOT-117 **MAT-117	Introductory Biology/ Elementary Mathematics	2 (1+1) 2 (2+0)	50+25+25 75+0+25	100
**AGH-118	Agricultural Heritage	1 (1+0)	75+0+25	100
ENG-119	Comprehension and Communication Skills in English	2 (1+1)	50+25+25	100
BPBA-1101/ BPBA-1102/ BPHC-1124	Compulsory Punjabi / Basic Punjabi (Mudhli Punjabi) Punjab History & Culture	2 (2+0) 2 (2+0) 2 (2+0)	75+0+25	100
*BDA-111	Drug Abuse: Problem, Management and Prevention (Compulsory)	1 (1+0) **NC**	100+0+0	100
*BPED-1111/ *BYOG-1111/ NCC-1111/ NSS-1111	Physical Education/ Yoga National Cadet Corps National Service Scheme	2 (0+2) **NC**	100+0+0	100
	Total Credit Hours	**26 (23+03*NC)**		**1000**

Note:

1. Mathematics for those students who have passed 10+2 (Medical).
2. Biology for those students who have passed 10 +2 (Non Medical).
3. Basic Punjabi (Mudhli Punjabi) for those students who have not passed 10or +2 with Punjabi subject. Total Internal Assessment of 25 marks (House Test - 10; Attendance - 10; Conduct & Academic, Extra Curricular Activities - 5).

*NC- Non Credited Course.
**Remedial Courses.

B.Sc. (Hons.) Agriculture.

SEMESTER-II

Course Code	Subject	Credit hours per week (Th+Prac)	Marks Distribution Th.+Prac+I.A	Maximum Marks
BCT-121	Fundamentals of Plant Biochemistry and Biotechnology	3 (2+1)	50+25+25	100
FSC-122	Fundamentals of Horticulture	2 (1+1)	50+25+25	100
EXT-123	Communication Skills and Personality Development	2 (1+1)	50+25+25	100
BOT-124	Fundamentals of Crop Physiology	2 (1+1)	50+25+25	100
AGE-125	Fundamentals of Agricultural Economics	2 (2+0)	75+0+25	100
PPL-126	Fundamentals of Plant Pathology	4 (3+1)	50+25+25	100
ENT-127	Fundamentals of Entomology	4 (3+1)	50+25+25	100
EXT-128	Fundamentals of Agricultural Extension Education	3 (2+1)	50+25+25	100
DMT-129	Disaster Management	1(1+0)	75+0+25	100
BPBA-1201/ BPBA-1202/ BPHC-1224	Compulsory Punjabi/ Basic Punjabi (Mudhli Punjabi) Punjab History & Culture	2 (2+0) 2 (2+0) 2 (2+0)	75+0+25	100
*BDA-121	Drug Abuse: Problem, Management and Prevention (Compulsory)	1 (1+0) **NC**	100+0+0	100
*BPED-1210/ *BYOG-1210/ NCC-1210/ NSS-1210	Physical Education/ Yoga National Cadet Corps National Service Scheme	2 (0+2) **NC**	100+0+0	100
	TOTAL	**28 (25+03*(NC))**		**1000**

Note: Basic Punjabi (Mudhli Punjabi) for those students who have not passed 10 or +2 with Punjabi subject.

Total Internal Assessment of 25 marks (House Test - 10; Attendance - 10; Conduct & Academic, Extra Curricular Activities - 5).

*NC- Non-Credited.

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SEMESTER-III

Course Code	Subject	Credit hours per week	Marks Distribution	Maximum Marks
		(Th+Prac)	Th.+Prac+I.A	
AGR-211	Crop Production Technology-I (*Kharif* Crops)	2 (1+1)	50+25+25	100
AGE-212	Agricultural Marketing, Trade and Prices	3 (2+1)	50+25+25	100
AGE-213	Agricultural finance and Co-operation	3 (2+1)	50+25+25	100
FSC-214	Production Technology for Fruit and Plantation crops	2 (1+1)	50+25+25	100
AEN-215	Farm Machinery and Power	2 (1+1)	50+25+25	100
VSC-216	Production Technology for Vegetables and Spices	2 (1+1)	50+25+25	100
AGI-217	Agri-Informatics	2 (1+1)	50+25+25	100
PBG-218	Principles of Seed Technology	2 (1+1)	50+25+25	100
AEN-219	Soil & Water Conservation Engineering	1(1+1)	50+25+25	100
ESL-2110	Environmental Studies	4 (3+1)	50+25+25	100
*HVE-2111	Human Values and Ethics	1 (1+0) **NC**	100+0+0	100
	Total	**24 (23+1*(NC))**		**1000**

*NC- Non Credited.

Total Internal Assessment of 25 marks (House Test - 10; Attendance - 10; Conduct & Academic, Extra Curricular Activities - 5).

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SEMESTER-IV

Course Code	Subject	Credit hours per week	Marks Distribution	Maximum Marks
		(Th+Prac)	Th.+Prac+I.A	
AGR-221	Crop Production Technology-II (*Rabi* Crops)	2 (1+1)	50+25+25	100
FSC-222	Production technology for Ornamental Crops, MAP and Landscaping	2 (1+1)	50+25+25	100
AEN-223	Renewable Energy and Green Technology	2 (1+1)	50+25+25	100
SSC- 224	Problematic Soils and their Management	2 (2+0)	75+0+25	100
LPM-225	Livestock and Poultry Management	4 (3+1)	50+25+25	100
STA-226	Statistical Methods	2 (1+1)	50+25+25	100
AGR-227	Farming System and Sustainable Agriculture	1 (1+0)	75+0+25	100
PBG-228	Fundamentals of Plant Breeding	3 (2+1)	50+25+25	100
AGM-229	Introductory Agro-meteorology and Climate Change	2 (1+1)	50+25+25	100
(Elective-I) ACH-2210 WMG-2210 BPF-2210 SSA-2210	(Any one option) Agrochemicals Weed Management Biopesticides & Biofertilizers System Simulation and Agro-Advisory	3 (2+1)	50+25+25	100
Total		**23**		**1000**

Total Internal Assessment of 25 marks (House Test - 10; Attendance - 10; Conduct & Academic, Extra Curricular Activities - 5).

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SEMESTER-V

Course	Subject	Credit hours Per week (Th+Prac)	Marks Distribution Th.+Prac+I.A	Maximum Marks
AGR-311	Practical Crop Production-I *(Kharif Crops)*	2 (0+2)	0+75+25	100
PPL-312	Principles of Integrated Pest and Disease Management	3 (2+1)	50+25+25	100
SSC-313	Manures, Fertilizer and Soil Fertility Management	3 (2+1)	50+25+25	100
ENT-314	Pests of Crops and Stored Grains and Their Management	3 (2+1)	50+25+25	100
PPL-315	Diseases of Field and Horticultural Crops and their Management-I	3 (2+1)	50+25+25	100
PBG-316	Crop Improvement-I (*Kharif*)	2 (1+1)	50+25+25	100
EXT-317	Entrepreneurship Development and Business Communication	2 (1+1)	50+25+25	100
AGR-318	Geoinformatics and Nano-Technology and Precision Farming	2 (1+1)	50+25+25	100
FST-319	Principles of Food Science and Nutrition	2 (2+0)	75+0+25	100
(Elective-I)PCV-3110 MPT-3110 LSP-3110 HTH-3110	(Any one option) Protected Cultivation Micro Propagation Technique Landscaping Hi-Tech Horticulture	3 (2+1)	50+25+25	100
	Total	**25 (15+10)**		**1000**

Total Internal Assessment of 25 marks (House Test - 10; Attendance - 10; Conduct & Academic, Extra Curricular Activities - 5).

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SEMESTER-VI

Course	Subject	Period Per week (Th.+Prt.)	Marks Distribution Th.+Prac+I.A	Maximum Marks
AGR-321	Practical Crop Production-II *(Rabi Crops)*	2 (0+2)	0+75+25	100
AGR-322	Rainfed Agriculture and Watershed Management	2 (1+1)	50+25+25	100
AEN-323	Protected Cultivation and Secondary Agriculture	2 (1+1)	50+25+25	100
PPL-324	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)	50+25+25	100
FSC-325	Post Harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)	50+25+25	100
ENT-326	Management of Beneficial Insects	2 (1+1)	50+25+25	100
PBG-327	Crop Improvement-II (*Rabi*)	2 (1+1)	50+25+25	100
AGR-328	Principles of Organic Farming	2 (1+1)	50+25+25	100
AGE-329	Farm Management, Production and Resource Economics	2 (1+1)	50+25+25	100
IPR-3210	Intellectual Property Rights	1 (1+0)	75+0+25	100
(Elective-III) ABM-3211 CPB-3211 FSS-3211 ACJ-3211	(Any one option) Agri-business Management Commercial Plant Breeding Food Safety and Standards Agricultural Journalism	3 (2+1)	50+25+25	100
Total		**23 (12+10)**		**1100**

Total Internal Assessment to be given = 25% (House Test - 10%; Attendance - 10%; Conduct & Academic,Extra Curricular Activities - 5%).

B.Sc. (Hons.) Agriculture.

SEMESTER VII

Rural Agricultural Work Experience and Agro-Industrial Attachment (RAWE & AIA)

Sr. No.	Course Code	Training Components	Number of weeks	Credit hours per week	Total Marks
1.	RAWE-411	General Orientation and Village Attachment	8	6 (0+6)	100
3.	RAWE-412	Plant Clinic	4	3 (0+3)	100
4.	AIA-413	Agro-Industrial Attachment-I	4	3 (0+3)	100
5.	AIA-414	Agro-Industrial Attachment-II	4	3 (0+3)	100
		Total	**20**	**15 (0+15)**	

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SEMESTER VIII

Experiential Learning Programmes

Modules for skill development and entrepreneurship. A student has to register for two modules from the following package of modules: (Any two):

Sr. No.	Course Code	Experiential Learning Modules (Any two of the following options)	Credits per week	Total Marks
	ELM-422	Mushroom Cultivation Technology	10 (0+10)	100
	ELM-423	Soil, Plant, Water and Seed Testing	10 (0+10)	100
	ELM-424	Commercial Beekeeping	10 (0+10)	100
	ELM-425	Floriculture & Landscaping	10 (0+10)	100
	ELM-426	Commercial Horticulture	10 (0+10)	100
	ELM-427	Food Processing	10 (0+10)	100
	ELM-428	Organic Production Technology	10 (0+10)	100
	ELM-429	Vegetable Production under Protected Environment	10 (0+10)	100
		Educational Tour	**2 (0+2 NC)**	**NC**
	Grand Total		**22 (20+2*NC)**	

Summary:

Semester	Credit hour per week
I	25 (23+2*)
II	27 (25+2*)
III	25 (23+2*)
IV	24 (23+1*)
V	25
VI	23
VII	15
VIII	22 (20+2*)
Total	186 (177+9*NC)

B.Sc. (Hons.) Agriculture. Semester-I

MBL-111: Agricultural Microbiology

Credit hours per week 2(1+1)
Max. Marks: 100
Time: 3 Hours **Theory: 50**
Practical: 25
Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

- To understand the basic concepts of microbiology
- To study the different tools and techniques used in microbiology
- To study microbial growth and different biochemical pathways used for the same.
- To understand the role of microbes in soil fertility and crop production
- To study the role of Microbes in human welfare:

Theory:

Section-A: Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial Genetics: Genetic recombination- transformation, conjugation and transduction, plasmids, transposons.

Section-B: Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and sulphur cycles.

Section-C: Biological nitrogen fixation- symbiotic, associative and aysmbiotic. *Azolla*, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.

Section-D: Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Practical

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of *Rhizobium* from legume

root nodule. Isolation of *Azotobacter* from soil. Isolation of *Azospirillum* from roots. Isolation of BGA, Staining and microscopic examination of microbes.

Suggested books:-

- Pelczar MJ, Chan ECS and Krieg NR. Microbiology. McGraw Hill Book Company.
- Stanier, R.Y. General Microbiology. Macmillian Publishers.
- R.P Singh Microbiology, Kalyani Publishers

Course Outcomes:-

Course Title: Agricultural Microbiology **Course Code: MBL-111**

Sr. No.	**On completing the course, the students will be able to:**
CO1	Know about general characteristics of bacteria and their isolation using various techniques.
CO2	Deal with microbiology of soil fertility using various processes such as nitrogen fixation, microbial degradation of organic matter and soil nutrient transformation

B.Sc. (Hons.) Agriculture. Semester-I

PBG-112 **Fundamentals of Genetics**

Credit hours per week 3 (2+1)
Max. Marks: 100
Time: 3 Hours **Theory: 50**
Practical: 25
Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objective:

- Students get acquainted with basic concepts of heredity, ie, characters, mendelian factors (genes), their inheritance from parents to offspring.
- They come to know about chromosomes (the bearers of hereditary factors, their structure and functions.
- They come to know about cell cycle and cell division (mitosis and meiosis), probability and chi-square, types of dominance and gene interaction (epistasis) , multiple alleles, sex determination and sex-linkage.
- They come to know about the phenomenon of linkage and crossing over, qualitative and quantitative inheritance (multiple factors hypothesis), changes in chromosomes (structural and numerical).
- Gene mutations and their induction.
  They come to know about DNA, RNA and their function in protein synthesis, gene structure, function and their regulation

Theory

Section-A: Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonemata, chromomeres, centromere,
secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance. Cell cycle and cell division- mitosis and meiosis.Probability and Chi-square. Dominance relationships, Epistatic interactions with example

Section-B: Multiple alleles, pleiotropism and pseudoalleles. Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping.

Section-C: Structural and numerical variations in chromosomes and their implications, Mutation, classification, methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders.

Section-D: Nature, structure & replication of genetic material. Protein synthesis, transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Practical

Study of microscope. Study of cell structure. Mitosis and Meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structures.

Suggested Readings:-

- 'Principles of genetics' by Gardener, Simon and Snusted by John Wiely and Sons,inc.
- 'Principles of genetics' by S. S Randhawa and Sonia Sharma .
- 'Genetics 'by Sr.Owen and Edgar **.**
- 'Genetics 'by B.D Singh (Kalyani Publishers).
- 'Genetics' by P.K Gupta (Rastogi publications).

Course Title: Fundamentals of Genetics **Course Code: PBG-112**

Sr. No.	**On completing the course, the students will be able to:**
CO1	Study about production of Genetically modified varieties/breeds of crops/livestock
CO2	Understand the genetic concepts related to health and diseases, food and natural resources, environment and role of genetic mechanisms in evolution.

B.Sc. (Hons.) Agriculture. Semester-I

SSC-113: Fundamentals of Soil Science

Credit hours per week 3 (2+1)
Max. Marks: 100
Time: 3 Hours **Theory: 50**
Practical: 25
Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

- To impart knowledge about basic concept of rock forming minerals, process of soil formation, soil classification, physical properties of soils and processes in relation to plant growth.
- This course also familiarize student with soil colloids, ion exchange phenomenon, problematic soil.
- To provide knowledge on organic matter and describe how to promote populations of beneficial soil organisms.
  Learn how soil health relates to the soil ecology and soil environment quality

Theory:

Section-A: Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering & processes. Factors of soil formation; Soil Profile, components of soil;

Section-B: Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; elementary knowledge of soil taxonomy & soil classification, soils of India; Soil water retention, movement and availability;

Section-C: Soil air, composition, gaseous exchange, problem and plant growth; Soil temperature; source, amount and flow of heat in soil and effect on plant growth; Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability;

Section-D: Soil colloids - inorganic and organic; silicate clays: constitution and properties; source of charge, ion exchange, cation exchange capacity, base saturation, soil organic matter: composition, properties and its influence on soil properties; humic substances- nature and properties soil organisms: macro and micro organisms, their beneficial and harmful effects; soil

pollution- bahaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution .

Practical:

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture feel and Bouyoucos methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Demonstration of heat transfer in soil. Study of soil map. Determination of soil colour. Estimation of organic matter content of soil.

Suggested reading

1. Textbook of Pedogy - J.Sehgal.
2. Fundamentals of Soil - V.N. Sahai.
3. Introductory Soil Science- D.K Das.
4. Laboratory Manual of Introduction to soils - P.K. Sharma and P.S. Sidhu.
5. Practical Manual of Introduction to soils- H.S. Jassal and S.S. Kukal.

Course Title: Fundamentals of Soil Science **Course Code: SSC-113**

Sr. No.	**On completing the course, the students will be able to:**
CO1	Get knowledge about soil, its formation and weathering process
CO2	Understand about physical and chemical properties of soil and their effect on plant's health.
CO3	Get knowledge on organic matter and describe how to promote populations of beneficial soil organisms.
CO4	Learn how soil health relates to the ecology and environments, both currently and in the future

B.Sc. (Hons.) Agriculture. Semester-I

FOR-114: Introduction to Forestry

Time: 3 Hours **Credit hours per week 2(1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

- To acquaint the students with the identification, nursery raising, and plantation of different tree species prevalent under Punjab and Indian conditions.
- To know the core concepts of forestry.
- To familiarize the students with biometric studies of forest trees.
- To understand the basicconcept of agroforestry and its economic importance in agriculture.

Theory:

Section-A: Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration -Natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers;

Section-B: Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. 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;

Section-C: 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.

Section-D: 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

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

Suggested Books:-

- Agroforestry Systems (A New Challenge): PK Khosla, Sunil Puri and DK Khurana (Indian Society of Tree Scientists)
- An Introduction to Agroforestry: PK Ramachandran Nair (Kulwer Academic Publishers)
- Forest Mensuration and Biometry: LS Khanna and AN Chaturvedi (Published by- Khanna Bandhu)
- Handbook of Forestry: LS Khanna and AN Chaturvedi (Part I & Part II)
- Indian Forestry: K Manikandan and S Prabhu (Jain Brothers)
- Introduction to Forestry: SR Reddy and C Nagamani (Kalyani Publishers)
- Textbook of Agroforestry: BS Chundawat and SK Gautam (Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi)

Course Outcomes:-Course Title Introduction to Forestry

Course Code: FOR-114

Sr. No.	On completing the course, the students will be able to:
CO1	Know how to grow nurseries and various forest trees, their management at field level.
CO2	Study the production potential of trees by measuring their biomass production.

B.Sc. (Hons.) Agriculture. Semester-I

AGR-115: Fundamentals of Agronomy

Time: 3 Hours **Credit hours per week 4 (3+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:-

1. Summoning information from related disciplines such as Botany, Soil Science, Irrigation, plant protection, Plant Genetics and Breeding, Agrometeorology etc.
2. Imparting knowledge about Indian Agriculture and importance, present status, scope and future prospect.
3. Dealing with all aspects of crop cultivation and production.

Theory:

Section-A: Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry. Crop nutrition, manures and fertilizers, nutrient use efficiency,

Section-B: Water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging.

Section-C: Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

Section-D: Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

Practical:

B.Sc. (Hons.) Agriculture. Semester-I

Identification of crops, seeds, fertilizers, pesticides and tillage implements, Study of Agroclimatic zone of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

Suggested Books: - Principles and Practices of Agronomy **Authors** P. Balasubramaniyan and SP. Palaniappan **Publisher**: Agrobios (India)

Principles and Practices of Agronomy S.S. Singh and Rajesh Singh Kalyani Publishers

Principles of Agronomy SR Reddy Kalyani Publishers

Problems of Field Crops PAU Publications

Course Outcomes:-Course Title: Fundamentals of Agronomy
Course Code: AGR-115

Sr. No.	On completing the course, the students will be able to:
CO1	Get knowledge about various aspects of crop cultivation and production.
CO2	Know how agronomy often involves a summoning of resources from related disciplines such as Botany, Soil Science, Irrigation, plant protection, Plant Genetics and Breeding, Agro meteorology etc.
CO3	Learn crop cultivation and management for the purpose of producing food for humans, feed for animals as well as raw materials for the industry.
CO4	Get knowledge about Indian agriculture ,its importance, present status, scope and future prospect.
CO5	Know about cropping seasons of India; soil formation, classification, physical, chemical properties; identification of important crops and crop seeds.

B.Sc. (Hons.) Agriculture. Semester-I

EXT-116: Rural Sociology & Educational Psychology

Time: 3 Hours **Credit hours per week 2 (2+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course objectives:

The main objective of the course is to generate the awareness about various issues and problems of rural society. It also aims at describing the concept of rural society and its importance in agricultural extension.

Theory:

Section-A: Sociology and Rural sociology: Definition and scope, its significance in agriculture extension.

Section-B: Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.

Section-C: Educational psychology: Meaning & its importance in agricultureextension. Behavior: Cognitive, affective, psychomotor domain.

Section-D: Personality, Learning, Motivation, Theories of Motivation, Intelligence

Suggested readings:

1. Mondal S., 2018, Rural sociology and Educational Psychology. Kalyani Publishers, New Delhi.
2. Kumar A. and Lal B. 2018, fundamentals of rural sociology and Educational Psychology. Write and Print Publications.

B.Sc. (Hons.) Agriculture. Semester-I

Course Title: Rural Sociology & Educational Psychology Course Code: EXT-116

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the concepts of rural sociology, its importance in Agricultural Extension, characteristics of Indian rural sociology.
CO2	Get themselves acquainted with village institutions and social organizations.
CO3	Study personality types, leadership types and emotions of human beings

B.Sc. (Hons.) Agriculture. Semester-I

****BOT-117 Introductory Biology**

Credit hours per week 2(1+1)

Time: 3 Hours **Max. Marks: 100**

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:-

1. Basic understanding of diversity of life forms.
2. Introduction of components and processes at each level of hierarchy.
3. Elements of classification, seed structure, morphology and modifications of plants.
4. To generate awareness regarding taxonomy and study of representative members of families and their economic importance.

Theory:

Unit-I: Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.

Unit-II: Binomial nomenclature and classification of Cell and cell division.

Unit-III: Morphology of flowering plants. Seed and seed germination.

Unit-IV: Plant systematics- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

Practical

Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, flower and fruits. Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides. Description of plants - Brassicaceae, Fabaceae and Poaceae.

Suggested Readings:-

1. Dhami P.S., Chopra G. and Srivastava H.N. (2020). A text book of Biology. Pradeep Publications, Jalandhar, India.

2. Taylor M.R., Simon E.J., Dickey J., Hogan K.A. and Reece J.B. (2018). Campbell biology: Concepts & connections. Pearson, New York.
3. Randhawa S.S. and Mahajan K. (2017). A text book of Remedial Biology. S. Vikas and Company, Jalandhar, India.
4. Handbook of Biology (2014). Arihant Publications, New Delhi, India.

Course Title: Introductory Biology **Course Code: BOT-117**

Sr. No.	**On completing the course, the students will be able to:**
CO1	Know the basics of biology, origin of life, evolution of new species and eugenics.
CO2	Study cell structures and cell division which will help them to understand the functions of life and genetics, crop physiology and plant breeding.
CO3	Know that the Study of classification and taxonomy of plants forms the basis for selection of close relatives of crop plants during their breeding.
CO4	Know how the study of morphology of plants and their anatomy is essential for identification of crop plants, their wild relatives and various varieties. Study of fruits is essential in horticulture.
CO5	Understand the role of animals in agriculture is important in crop protection, apiculture, aquaculture, poultry, animal husbandry, etc.

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B.Sc. (Hons.) Agriculture. Semester-I

***MAT-117 Elementary Mathematics**

Time: 3 Hours **Credit hours per week 2(2+0)**
Max. Marks: 100
Theory: 75
Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 marks each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course Objective: Objective of this course is to enable the students to get knowledge about Straight lines, Circle, Differential Calculus, Integral Calculus, Matrix and Determinants.

Theory:

Sec-A: Straight lines : Distance formula, section formula (internal and external division), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line,
Sec-B: Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two straight lines, Angles between two straight lines, Parallel lines, Perpendicular lines.
Sec-C: Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2,y_2).
Sec-D: Definition of function, limit and continuity(of algebraic functions)
Sec-E: Differential Calculus: Differentiation of algebraic functions, exponential functions and logarithmic differentiation (excluding trigonometric functions). Derivative of sum, difference, product and quotient of two functions.

Sec-F:Integral Calculus : Integration of Product of two functions, Integration by substitution method, Definite Integrals (of algebraic functions).

Sec-G: Matrix: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose of matrix up to 3^{rd} order.
Sec-H: Determinants: Properties of determinants and their evaluation, Inverse of matrix up to 3^{rd} order. Matrix method.

Suggested Books:

1. Thomas Calculus - George B. Thomas,
2. A Text book of Matrices - Shanti Narayan.
3. Elementary book of Matices- Shanti Narayan

Course Outcomes:-

On Completion of the course, students are able to:

1. Learn the concept of function, limit and continuity.
2. Understand the properties of straight line and circle.
3. Differentiate definite integral and indefinite integral.

B.Sc. (Hons.) Agriculture. Semester – I

****AGH-118 Agricultural Heritage**

Time: 3 Hours **Credit hours per week 1(1+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 marks each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course Objectives:-

1. Student will relate past experience of agriculture with present situation
2. To understand agriculture situations in the country in relation to world.
3. To understand classification of crops and their importance.

Theory

Section-A: Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture;

Section-B: Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge;

Section-C: Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications;

Section-D: National agriculture setup in India; Current scenario of Indianagriculture; Indian agricultural concerns and future prospects.

Suggested Reading:

- Agriculture Heritage: SR Reddy (Kalyani Publishers)

Course Outcomes:-

1. Relate past experience of agriculture with present situation.
2. Understand agriculture situations in the country in relation to world.
3. Understand classification of crops and their importance

B.Sc. (Hons.) Agriculture. Semester – I

ENG-119 Comprehension and Communication Skills in English

Time: 3 Hours **Credit hours per week 2(1+1)**
Max. Marks: 100
Theory: 50
Practical: 25
Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of seven questions, The first question will be set from the three prescribed prose essays. There will be three questions and the students are required to answer any one in 300 words and it will carry 8 marks.
4. The next 6 questions will be set from the remaining syllabus and will carry 7 marks each. There will be internal choice wherever possible.

Course Objectives:-

- To enhance the communication skill like speaking, listening, reading the students.
- To make the capable presentation and writing skill.
- To make them self confident in all sphere like public meeting, conference, political level.
- Through the practical classes the students become confident to speak in English and Express their views.
- The courses have modules like listening skill, speaking skill and writing skill.
- It increases the efficiency the students.
- It gives job satisfaction to the organisation.

Course Contents:

1. **Prose:**
   a. War Minus Shooting: The Sporting Spirit-George Orwell
   b. A Dilemma- A Layman Look at Science – Raymond B Fosdick
   c. You and Your English- Spoken and Broken English - G.B. Shaw
2. Reading Comprehension
3. Vocabulary: Antonym, Synonym, Homophones and Homonyms
4. Articles, Preposition, Verb, Subject-Verb Agreement, Transformation of Sentences, and Narration
5. Precise Writing and Report Writing
6. Importance of Professional Writing and Curriculum Vitae
7. Interviews: kinds, Importance and Process

Practical:

1. Listening to short talks, lectures, Speeches

2. Stress and Intonation: Pace of Speech and Clarity of Voice
3. Reading dialogues, Rapid reading, and Intensive Reading
4. Group Discussion

Suggested Readings:-

1. Oxford guide to effective writing and speaking by John Seely.
2. The written word by Vandana R Singh, Oxford University Press.

Course Title: Communication Skills in English **CourseCode: ENG-119**

Sr. No.	**On completing the course, the students will be able to:**
CO1	Get knowledge to enhance their reading and writing skills.
CO2	Learn vocabulary and transformation of sentences

B.Sc. (Hons.) Agriculture. Semester – I

BPBA-1101 **Compulsory Punjabi**

ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

Time: 3 Hours **Credit hours per week 2(2+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤਦੇਰੰਗ, ਡਾ. ਮਹਿਲਸਿੰਘ (ਸੰਪਾ.), ਰਵੀਸਾਹਿਤਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
ਭਾਗਪਹਿਲਾ - ਕਵਿਤਾਅਤੇਕਹਾਣੀ, ਡਾ. ਆਤਮਰੰਧਾਵਾਅਤੇਡਾ. ਪਰਮਿੰਦਰਸਿੰਘ (ਸਹਿਸੰਪਾ.)
(ਕਵਿਤਾਭਾਗਵਿਚੋਂਪ੍ਰਸੰਗਸਹਿਤਵਿਆਖਿਆ/ਕਵਿਤਾਦਾਵਿਸ਼ਾ-ਵਸਤੂ। ਕਹਾਣੀਭਾਗਵਿਚੋਂਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ)

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective

- ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ।
- ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਸਾਹਿਤਕ ਸਮਝ ਵਿਕਸਤ ਕਰਨੀ।
- ਮਾਤ-ਭਾਸ਼ਾ ਦੀ ਸਮਝ ਨੂੰ ਵਧਾਉਣਾ।

ਭਾਗ-ਦੂਜਾ

(ੳ) ਪੈਰ੍ਹਾਰਚਨਾ
(ਅ) ਪੈਰ੍ਹਾਪੜ੍ਹਕੇਪ੍ਰਸ਼ਨਾਂਦੇਉੱਤਰ

ਭਾਗ-ਤੀਜਾ

(ੳ) ਪੰਜਾਬੀਧੁਨੀਵਿਉਂਤ : ਉਚਾਰਨਅੰਗ, ਉਚਾਰਨਸਥਾਨਤੇਵਿਧੀਆਂ, ਸਵਰ, ਵਿਅੰਜਨ, ਸੁਰ
(ਅ) ਭਾਸ਼ਾਵੰਨਗੀਆਂ : ਭਾਸ਼ਾਦਾਟਕਸਾਲੀਰੂਪ, ਭਾਸ਼ਾਅਤੇਉਪ-ਭਾਸ਼ਾਦਾਅੰਤਰ,
ਪੰਜਾਬੀਉਪਭਾਸ਼ਾਵਾਂਦੇਪਛਾਣ-ਚਿੰਨ੍ਹ

ਭਾਗ-ਚੌਥਾ

ਮਾਤਭਾਸ਼ਾਦਾਅਧਿਆਪਨ
(ੳ) ਪਹਿਲੀਭਾਸ਼ਾਦੇਤੌਰਉੱਤੇ
(ਅ) ਦੂਜੀਭਾਸ਼ਾਦੇਤੌਰਉੱਤੇ

ਅੰਕ-ਵੰਡਅਤੇਪ੍ਰੀਖਿਅਕਲਈਹਦਾਇਤਾਂ

1. ਸਿਲੇਬਸਦੇਚਾਰਭਾਗਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇਪੰਜ ਭਾਗ ਹੋਣਗੇ।
2. ਪਹਿਲੇਚਾਰਭਾਗਾਂਵਿਚ 02-02 ਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇ। ਹਰੇਕਭਾਗਵਿਚੋਂ 01-01 ਪ੍ਰਸ਼ਨਕਰਨਾਲਾਜ਼ਮੀਹੋਵੇਗਾ। ਹਰੇਕਪ੍ਰਸ਼ਨਦੇਬਰਾਬਰ (08) ਅੰਕਹੋਣਗੇ।
3. ਪ੍ਰਸ਼ਨਪੱਤਰਦੇਪੰਜਵੇਂਭਾਗਵਿਚਸਾਰੇਸਿਲੇਬਸਵਿਚੋਂ 01-01 ਅੰਕਦੇ ਛੇ ਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇ, ਜਿਨ੍ਹਾਂਵਿਚੋਂ 05 ਪ੍ਰਸ਼ਨਾਂਦੇਉੱਤਰਦੇਣਾਲਾਜ਼ਮੀਹੋਵੇਗਾ।
4. ਪੇਪਰਸੈੱਟਕਰਨਵਾਲਾਜੇਕਰਚਾਹੇਤਾਂਪ੍ਰਸ਼ਨਾਂਦੀਵੰਡਅੱਗੋਂਵੱਧਤੋਂਵੱਧਚਾਰਉਪ-ਪ੍ਰਸ਼ਨਾਂਵਿਚਕਰਸਕਦਾਹੈ।

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ਨੋਟ :ਇੰਟਰਨਲਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂਦੀਹੈ, ਜੋ ਕਾਲਜਵੱਲੋਂਨਿਰਧਾਰਿਤਦਿਸ਼ਾਨਿਰਦੇਸ਼ਾਂਅਨੁਸਾਰਇਨ੍ਹਾਂਅੰਕਾਂ ਤੋਂਵੱਖਰੀਹੋਵੇਗੀ।ਇਸਪੇਪਰਦੇਕੁੱਲਅੰਕ 37+13 = 50 ਹਨ।

ਪੁਸਤਕਾਂ:

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਭਾਗ ਪਹਿਲਾ, ਦੂਜਾ, ਤੀਜਾ ਡਾ: ਜੁਗਿੰਦਰ ਸਿੰਘ ਪਵਾਰ ਅਤੇ ਹੋਰ ਭਾਸ਼ਾ ਅਕਾਦਮੀ ਜਲੰਧਰ

ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਸਾਹਿਤ ਦਾ ਇਤਿਹਾਸ ਡਾ: ਜਸਵਿੰਦਰ ਸਿੰਘ ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ।

ਵਿਹਾਰਿਕ ਸਮੀਖਿਆ (ਕਵਿਤਾ ਅਤੇ ਵਾਰਤਾ) ਡਾ: ਸਤਿੰਦਰ ਸਿੰਘ ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ।

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਬੋਧ ਕਸਤੂਰੀ ਲਾਲ ਐਂਡ ਸੰਨਜ਼ ਅੰਮ੍ਰਿਤਸਰ।

ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)

- ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਸਾਹਿਤਕ ਸਮਝ ਵਿਕਸਤ ਹੋਵੇਗੀ।
- ਉਨ੍ਹਾਂ ਅੰਦਰ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਪੈਦਾ ਹੋਵੇਗੀ।
- ਉਹ ਸੰਬੰਧਿਤ ਵਿਸ਼ੇ ਦਾ ਗਹਿਨ ਅਧਿਐਨ ਕਰਨ ਦੇ ਕਾਬਲ ਹੋਣਗੇ।
- ਉਨ੍ਹਾਂ ਦਾ ਭਾਸ਼ਾਈ ਗਿਆਨ ਵਿਕਸਤ ਹੋਵੇਗਾ।
- ਉਨ੍ਹਾਂ ਦੇ ਮਾਤ-ਭਾਸ਼ਾ ਸੰਬੰਧੀ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਹੋਵੇਗਾ।

B.Sc. (Hons.) Agriculture. Semester – I

BPBA-1102 **Basic Punjabi**

ਮੁੱਢਲੀ ਪੰਜਾਬੀ

(In Lieu of Compulsory Punjabi)

Time: 3 Hours **Credit hours per week 2(2+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਪੰਜਾਬੀਭਾਸ਼ਾਤੇਗੁਰਮੁਖੀਲਿਪੀ :

ਨਾਮਕਰਣਤੇਸੰਖੇਪਜਾਣ-ਪਛਾਣ :ਗੁਰਮੁਖੀਵਰਣਮਾਲਾ, ਅੱਖਰਕ੍ਰਮ, ਸਵਰਵਾਹਕ (ਓ, ਅ, ੲ), ਲਗਾਂ-ਮਾਤਰਾਂ, ਪੈਰਵਿਚਬਿੰਦੀਵਾਲੇਵਰਣ, ਪੈਰਵਿਚਪੈਣਵਾਲੇਵਰਣ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective

- ਵਿਦਿਆਰਥੀ ਨੂੰ ਸ਼ੁੱਧ ਪੰਜਾਬੀ ਪੜ੍ਹਨਾ-ਲਿਖਣਾ ਸਿਖਾਉਣਾ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀਆਂ ਵਿਆਕਰਨਕ ਬਾਰੀਕੀਆਂ ਤੋਂ ਜਾਣੂ ਕਰਾਉਣਾ।
- ਸ਼ੁੱਧ ਸੰਚਾਰ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ।

ਭਾਗ-ਦੂਜਾ

ਗੁਰਮੁਖੀਆਰਥੋਗਰਾਫੀਅਤੇਉਚਾਰਨ :

ਸਵਰ, ਵਿਅੰਜਨ :ਮੁੱਢਲੀਜਾਣ-ਪਛਾਣਅਤੇਉਚਾਰਣ, ਮੁਹਾਰਨੀ, ਲਗਾਂ-ਮਾਤਰਾਂਦੀਪਛਾਣ

ਭਾਗ-ਤੀਜਾ

ਪੰਜਾਬੀਸ਼ਬਦ-ਜੋੜ :

ਮੁਕਤਾ (ਦੋ ਅੱਖਰਾਂਵਾਲੇਸ਼ਬਦ, ਤਿੰਨਅੱਖਰਾਂਵਾਲੇਸ਼ਬਦ), ਸਿਹਾਰੀਵਾਲੇਸ਼ਬਦ, ਬਿਹਾਰੀਵਾਲੇਸ਼ਬਦ, ਔਂਕੜਵਾਲੇਸ਼ਬਦ, ਦੁਲੈਂਕੜਵਾਲੇਸ਼ਬਦ, ਲਾਂਵਾਲੇਸ਼ਬਦ, ਦੁਲਾਵਾਂਵਾਲੇਸ਼ਬਦ, ਹੋੜੇਵਾਲੇਸ਼ਬਦ, ਕਨੌੜੇਵਾਲੇਸ਼ਬਦ, ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) ਵਾਲੇਸ਼ਬਦ

ਭਾਗ-ਚੌਥਾ

ਸ਼ੁੱਧ-ਅਸ਼ੁੱਧਸ਼ਬਦ

ਅੰਕ-ਵੰਡਅਤੇਪ੍ਰੀਖਿਅਕਲਈਹਦਾਇਤਾਂ

1. ਪਹਿਲੇਭਾਗਵਿਚੋਂਚਾਰਵਰਣਨਾਤਮਕਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇਜਿਨ੍ਹਾਂਵਿਚੋਂਤਿੰਨਪ੍ਰਸ਼ਨਾਂਦਾਉੱਤਰਦੇਣਾਲਾਜ਼ਮੀਹੈ। ਹਰਪ੍ਰਸ਼ਨਦੇਚਾਰ-ਚਾਰਅੰਕਹਨ। (3x4)=12 **ਅੰਕ**
2. ਭਾਗਦੂਸਰਾਵਿਚੋਂ ਦੋ-ਦੋ ਅੰਕਦੇਪੰਜਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇ। ਸਾਰੇਪ੍ਰਸ਼ਨਲਾਜ਼ਮੀਹਨ। (5x2)=10 **ਅੰਕ**
3. ਭਾਗਤੀਸਰਾਵਿਚੋਂਤਿੰਨਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇਜਿਨ੍ਹਾਂਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨਹੱਲਕਰਨੇਲਾਜ਼ਮੀਹਨਜਿਨ੍ਹਾਂਦੇਪੰਜ-ਪੰਜਅੰਕਹਨ। (2x5)=10 **ਅੰਕ**
4. ਭਾਗਚੌਥਾਵਿਚਪੰਜਅਸ਼ੁੱਧਸ਼ਬਦਾਂਨੂੰਸ਼ੁੱਧਕਰਕੇਲਿਖਣਾਹੋਵੇਗਾ। (5x1)=05 **ਅੰਕ**

ਨੋਟ: ਇੰਟਰਨਲਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂਦੀਹੈ, ਜੋ ਕਾਲਜਵੱਲੋਂਨਿਰਧਾਰਿਤਦਿਸ਼ਾਨਿਰਦੇਸ਼ਾਂਅਨੁਸਾਰਇਨ੍ਹਾਂਅੰਕਾਂਤੋਂ

ਵੱਖਰੀਹੋਵੇਗੀ।ਇਸਪੇਪਰਦੇਕੁਲਅੰਕ 37+13 = 50 ਹਨ।

ਪੁਸਤਕਾਂ:

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਭਾਗ ਪਹਿਲਾ, ਦੂਜਾ, ਤੀਜਾ ਡਾ: ਜੁਗਿੰਦਰ ਸਿੰਘ ਪਵਾਰ ਅਤੇ ਹੋਰ ਭਾਸ਼ਾ ਅਕਾਦਮੀ ਜਲੰਧਰ

ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਸਾਹਿਤ ਦਾ ਇਤਿਹਾਸ ਡਾ: ਜਸਵਿੰਦਰ ਸਿੰਘ ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ।

ਵਿਹਾਰਿਕ ਸਮੀਖਿਆ (ਕਵਿਤਾ ਅਤੇ ਵਾਰਤਾ) ਡਾ: ਸਤਿੰਦਰ ਸਿੰਘ ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ।

ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਬੋਧ ਕਸਤੂਰੀ ਲਾਲ ਐਂਡ ਸੰਨਜ਼ ਅੰਮ੍ਰਿਤਸਰ।

ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)

- ਵਿਦਿਆਰਥੀਆਂ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ ਦੀ ਸਿਖਲਾਈ ਵਿਚ ਮੁਹਾਰਤ ਹਾਸਿਲ ਕਰਨਗੇ।
- ਉਹ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਚ ਮੁਹਾਰਨੀ, ਲਗਾਂ-ਮਾਤਰਾਂ, ਸਵਰ ਅਤੇ ਵਿਅੰਜਨ ਦੀ ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ ਦੁਆਰਾ ਸਮਝ ਨੂੰ ਵਿਕਸਿਤ ਕਰਨਗੇ।
- ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਸ਼ਬਦ-ਜੋੜਾਂ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਿਲ ਕਰ ਸ਼ੁੱਧ ਪੰਜਾਬੀ ਲਿਖਣ-ਪੜ੍ਹਨ ਦੇ ਸਮਰੱਥ ਹੋਣਗੇ।
- ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਵਿਆਕਰਨ ਪ੍ਰਬੰਧ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਿਲ ਕਰਨਗੇ।

B.Sc. (Hons.) Agriculture. Semester – I

BPHC-1124: PUNJAB HISTORY & CULTURE (From Earliest Times to 1000 A.D.)
(Special Paper in lieu of Punjabi compulsory)
(For those students who are not domicile of Punjab)

Time: 3 Hours **Credit hours per week: 2 (2+0)**
Total Marks: 100
Theory: 75
Internal Assessment: 25

Instructions for the Paper Setters:-

Section–A: The examiner will set 10 questions from the entire syllabus. All questions are compulsory. Answer to each question will be in about 100 words. Each question will carry 1.5 marks. The total weightage of this Section will be 15 marks.

Section B: The examiner will set 8 questions divided into four units. In each unit there will be two questions and the candidate will attempt one question from each unit in about 1000 words. Each question will carry 15 marks. The total weightage of this Section will be 60 marks.

Note: **The Medium of Instruction is English.**

Unit-I

1. Physical Features of the Punjab and their impact.
2. Sources of Ancient Punjab History.
3. Harappan Culture: Principal places, town planning, features of social and economic life, religion, causes of disappearance.

Unit-II

4. The Indo- Aryans: Original home and settlement in Punjab, political organisation, social, religious, and economic life during the Rigvedic Age
5. Impact of Buddhism and Jainism in the Punjab.
6. Political condition of the Punjab on the eve of Alexander's Invasions, account of the invasions and their impact.

Unit-III

7. The Punjab under Chander Gupta Maurya and Ashoka.
8. The Kushans and their contribution to Punjab.
9. The Punjab under the Vardhana Emperors.

Unit-IV

10. The Punjab from 7th Century to 1000 A.D. (Survey of Political History)
11. Development of Education and Literature in the Punjab upto 1000 A.D.
12. Development of Art and Architecture up to 1000 A.D.

Suggested Readings:-

1. L. Joshi (ed), *History and Culture of the Punjab*, Art-I, Patiala, 1989 (3rd edition)
2. L.M. Joshi and Fauja Singh (ed*), History of Punjab*, Vol.I, Patiala, 1977. 3. BudhaParkash,*Glimpses of Ancient Punjab*, Patiala, 1983.
4. B.N. Sharma, *Life in Northern India*, Delhi, 1966.

B.Sc. (Hons.) Agriculture. Semester – I

***BDA-111 Drug Abuse: Problem, Management and Prevention**

PROBLEM OF DRUG ABUSE

Time: 3 Hours **Credit hours per week 1(1+0) NC**
Max. Marks: 100
Theory: 100
Non Credited: S/US

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 20 marks (comprising of 10 short answer type questions of 2 marks each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (20).

UNIT–I

- **Meaning of Drug Abuse**

  Meaning, Nature and Extent of Drug Abuse in India and Punjab.

UNIT-II

- **Consequences of Drug Abuse for:**

  Individual: Education, Employment and Income.

  Family: Violence.

  Society: Crime.

  Nation: Law and Order problem.

UNIT-III

- **Management of Drug Abuse**

  Medical Management: Medication for treatment and to reduce withdrawal effects.

UNIT-IV

- Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
- Social Management: Family, Group therapy and Environmental Intervention.

B.Sc. (Hons.) Agriculture. Semester – I
*BPED-1111

Physical Education

Credit hours per week: 2 (0+2) NC
Max. Marks: 100
Practical: 100
Non Credited: S/US

- **Athletics Performance:** 100 Mtr race: 5 marks, Shot-put: 5 marks, Long jump: 5 marks (15 marks)
- **Game (Boys & Girls):** Fundamentals, Rules Performance (25 marks)
  Athletic, Football, Hockey, Volleyball, Cricket (5 marks each game)
- **Viva:** (20 marks)
- **Practical File:** (20 marks)
- **Specific Game Performance:** (20 marks)
  Any one: 20 marks (20-International, 18- National medalist,
  15-National participation, 12-State/Inter-college position, 10 State/Inter-college participation)

*BYOG-1111
(Yoga)

- **Viva:** Introduction and importance of Yoga, Main principle of yoga, Types of yoga (15 marks)
- **Practical file:** (10 marks)
- **Yogic Asana:** Meditative poses (Padma, Vajra, SukhAsanas) (20 marks)
  Cultural poses (Halasan, Sarvangasana, Bhujangasna, Salbhasana, Dhanurasana, Chakarasana) (20 marks)
- **Shudhi Kirya:** Jal neti, Nauli, Kapalbhati (15 marks)
- **Pranayam:** Surajbhedi, Ujjaiee, Shitkari, Bharmari, Shitli, (20 marks)
  Bhastrika, Kapalbhati

B.Sc. (Hons.) Agriculture. Semester – I

***NCC-1111** **(National Cadet Corps)**

Credit hours/week:2 (0+2) NC
Max. Marks: 100
Practical: 100
Non Credited: S/US

Section A **25 marks**

Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline. Drill- aim, general words of command, attention, stands at ease, stand easy and turning. Sizing, numbering, forming in three ranks, open and close order march and dressing.

Section B **25 marks**

Saluting at the halt, getting on parade, dismissing and falling out. Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.Turning on the march and wheeling.

Section C **25 marks**

Saluting on the march. Marking time, forward march and halt. Changing step, formation of squad and squad drill. Command and control, organization, badges of rank, honours and awards.

Section D **25 marks**

Nation Building- cultural heritage, religions, traditions and customs of India. National integration. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.

B.Sc. (Hons.) Agriculture. Semester – I

***NSS-1111 National Service Scheme**

Credit hours per week: 2 (0+2) NC
Max. Marks: 100
Practical: 100
Non Credited: S/US

UNIT-1 **25 marks**

Orientation of NSS volunteers: To get the NSS volunteers acquainted with the basics of NSS programmes, through lectures, discussions, field visits and audio-visuals etc.

UNIT-2 **25 marks**

Campus Work: The NSS volunteers may be involved in the projects undertaken for the benefit of the institution and students concerned. Such projects cover development of play grounds, layout of gardens, tree plantation in the premises, awareness programmes on drug-abuse, AIDS, population education and other projects.

UNIT-3 **25 marks**

Rural Project: The rural projects generally include the working of NSS volunteers in adopted villages for eradication of illiteracy, watershed management and wasteland development, agricultural operations, health, nutrition, hygiene, sanitation, mother and child care, family life education, gender justice, development of rural cooperatives etc.

Urban Projects: In addition to rural projects other include adult education, welfare of slum dwellers, training in civil defence, traffic control, setting up first-aid posts, environment and income generation projects etc. Professional and technical institutions having NSS may have to design appropriate programmes for the community based on the needs.

UNIT-4 **25 marks**

Natural calamities & National Emergencies: The NSS units are expected to utilize the services of NSS volunteers at the time of natural calamities and national emergencies for mobilizing public support and rendering necessary assistance to the authorities in rescue, relief and rehabilitation.

Special Camping Programme: Under this the students may attend 10 day camp with some specific projects by involving local communities.

B.Sc. (Hons.) Agriculture. Semester – II

BCT-121: Fundamentals of Plant Biochemistry and Biotechnology

Time: 3 Hours **Credit hours per week 3(2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives-

1. To introduce basic concept of plant biochemistry and biotechnology
2. To introduce the knowledge of plant tissue culture, solution preparation and different biochemical test.
3. To introduce the recent advances in plant biotechnology like plant and bacterial transformation.(Transgenics).
4. To make students familiar with different biochemistry and biotechnological laboratory techniques.

Theory

Section-A: Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharide's, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides. Lipid: Importance and classification. Proteins: Importance of proteins and classification; Structures, zwitter ions, nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action.

Section-B: Nucleic acids: Importance and classification; Structureof Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism ofcarbohydrates: Glycolysis, TCA cycle, Electron transport chain. Metabolism oflipids: Beta oxidation, Biosynthesis of fatty acids.

Section-C: Concepts and applications of plant biotechnology: embryo culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; somatic hybridization and cybrids

Section-D: Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and *Agrobacterium* mediated gene transfer methods; PCR techniques and its applications

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates, amino acids and proteins. Paper chromatography, Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants, micro-propagation, layer chromatography.

Suggested Readings –

1. Elements of Biotechnology – By P.K. Gupta
2. BIOS instant notes Biochemistry- By David Hames and Nigel Hooper
3. Biotechnology by- U Satyanarayana

- **Course Outcome-**

1. Students will be able to know about properties of different biomolecules like carbohydrates, fats proteins, DNA and RNA.

2. Students will be able to know about various biochemical cycles occurring in plant cell that are essential for plant growth and development like glycolysis,TCA, electron transport Chain, Beta oxidation and synthesis of fatty acids.

3. Students will be able to know about various techniques of plant biotechnology like tissue culture , embryo culture , pollen culture, artificial seeds, somatic hybridization cybrids , PCR technique, chromatography, electrophoresis and gene transfer method which include direct and indirect method (Agrobacterium mediated gene transfer method).

4. Students will be able to prepare buffer solution , can perform qualitative test for identifying various biochemical molecules like carbohydrates, fats and proteins and prepare MS media solution for tissue culture.

B.Sc. (Hons.) Agriculture. Semester – II

FSC-122: Fundamentals of Horticulture

Time: 3 Hours **Credit hours per week 2(1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

The main objective of this course is to introduce the students with a brief and prescribed knowledge of horticulture ; to introduce the students to the various cultural practices required for the production of horticultural crops.

Theory

Section-A: Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; principles of orchard establishment;climate and soil for horticultural crops;

Section-B: Plant propagation-methods and propagating structures; Seed dormancy, Seed germination,

Section-C: Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants;

Section-D: Importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different crops. Visits to commercial nurseries/orchard.

Suggested Readings :

1. Jitendra Singh (2018) *Basic Horticulture*. Kalyani Publishers.
2. Dr. T.D.Pandey, Dr. S.K.Verma (2019) *Fundamentals of Horticulture*. Kushal Publications and Distributors .

3. J.S. Bal (2016) *Fruit growing*. Kalyani Publishers.
4. *Package of Practices for Cultivation of Fruits*. PAU Ludhiana.
5. Dr. Bijendra Singh, Dr. Aakansha Goswami (2015) *Fundamentals of Horticulture*. Kalyani Publishers.

Course Outcomes:

After completion of the course the students will be able to:

1. Identify plant vegetative structure.
2. Know basic principles, processes and plant propagation methods.
3. Understand how to propagate plant, manage and harvest a variety of plant.
4. Learn how superior, disease free plant mass production can be produced.

B.Sc. (Hons.) Agriculture. Semester – II

EXT-123 Communication Skills and Personality Development

Time: 3 Hours **Credit hours per week 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of seven questions, The first question will be of 8 marks and remaining 6 questions will be of 7 marks.
4. There will be internal choice wherever possible.

Course Objectives:

1. I: To develop competence in written communication.
2. II: To inculcate innovative and critical thinking among the students.
3. III: To enable them to grasp the application of communication theories.
4. IV: To acquire the knowledge of latest technology related with communication skills.
5. V: To provide knowledge of multifarious opportunities in the field of this programme

Theory:

1. Meaning and process of communication, verbal and non verbal communication

2. Listening: Meaning, Types, Barriers and Effective Listening Skills

3. Field diary and Lab record: Indexing, Foot note and Bibliographic procedures

4. Reading and Comprehension of Technical articles

5. Note Taking: Summarizing and Abstracting

6. Individual and group presentation, impromptu presentation and public speaking

7. Organizing Seminars and Conferences

Practical:

1. Note Taking

2. Oral Presentation

3. Field diary and Lab record: Indexing, Foot note and Bibliographic procedures

4. Individual and group Presentation

5. Mock Interview

Suggested Readings:

1. Communication Skills- Singh and Bhatia, 3rd edition, Gandotra.
2. *Murphy's English Grammar* (by Raymond Murphy) CUP, 3RD Edition,2019.

Recommended Books:

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.

The Written Word by Vandana R Singh, Oxford University Press

B.Sc. (Hons.) Agriculture. Semester – II

BOT-124 **Fundamentals of Crop Physiology**

Time: 3 Hours **Credit hours per week 2(1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives-

To sensitize the overall development and engine of growth in agriculture, to make them aware of the availability of rich natural endowment to achieve sustainable agricultural development.

Theory:

Section-A: Basic concepts: Goods and services, desire, want, demand, utility, cost and price,wealth, capital, income and welfare. Agricultural economics: meaning, importance role of Agriculture in economic development. Agricultural planning anddevelopment in the country. Population: Malthusian theory, Elements of economic planning.

Section-B: *Demand:* meaning, law of demand, schedule and demand curve,determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle.Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticityof demand: concept and measurement of price elasticity, income elasticity and cross elasticity.

Section-C: Production: input output relationship. *Laws ofreturns*: Law of variable proportions and law of returns to scale. *Cost:* concepts, short run andlong run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinantsof supply, elasticity of supply. Market structure: meaning and types of market, basic features ofperfectly competitive and imperfect markets. Price determination under perfect competition;short run and long run equilibrium of firm and industry,

Section-D: *National income:* Meaning concepts of national income approaches to measurement, difficulties in measurement.Money: Bartersystem of exchange and its problems, meaning and functions of money, classificationof money, Agriculturaland public finance: micro v/s macro finance, need for agricultural finance, publicrevenue and public expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation,socialistic and mixed economies,

Suggested readings-

- Fundamentals of agricultural economics by Parveen kumar verma and santosh kumar nag.
- Fundamentals of agricultural economics by C.H.Shah.
- Fundamentals of agricultural economics by Nasir Husain

Course Outcomes:-

1. This course finalizes students with basic concepts of economics like demand, consumer equilibrium and utility analysis.
2. It also covers the supply aspects like laws of supply market structures and produces equilibrium.
3. Student lean and identify the opportunities available in flourishing sectors.
4. With this knowledge they can challenge the problems of unemployment, inequality, shortage of food production, poverty.
5. Gain knowledge of the causes of regional variations in productivity and production, social and economic inequality, and size of land holdings and lack of quality inputs.

B.Sc. (Hons.) Agriculture. Semester – II

AGE-125: Fundamentals of Agricultural Economics

Time: 3 Hours **Credit hours per week 2(2+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course Objectives-

To sensitize the overall development and engine of growth in agriculture, to make them aware of the availability of rich natural endowment to achieve sustainable agricultural development.

Theory:

Section-A: Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, importance role of Agriculture in economic development. Agricultural planning and development in the country. Population: Malthusian theory, Elements of economic planning.

Section-B: *Demand:* meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity.

Section-C: Production: input output relationship. *Laws of returns*: Law of variable proportions and law of returns to scale. *Cost:* concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry,

Section-D: *National income:* Meaning concepts of national income approaches to measurement, difficulties in measurement. Money: Bartersystem of exchange and its problems, meaning and functions of money, classification of money, Agricultural and public finance: micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation, socialistic and mixed economies,

Suggested readings-

- Fundamentals of agricultural economics by Parveen kumar verma and santosh kumar nag.
- Fundamentals of agricultural economics by C.H.Shah.
- Fundamentals of agricultural economics by Nasir Husain

Course Outcomes:-

1. This course finalizes students with basic concepts of economics like demand, consumer equilibrium and utility analysis.
2. It also covers the supply aspects like laws of supply market structures and produces equilibrium.
3. Student lean and identify the opportunities available in flourishing sectors.
4. With this knowledge they can challenge the problems of unemployment, inequality, shortage of food production, poverty.
5. Gain knowledge of the causes of regional variations in productivity and production, social and economic inequality, and size of land holdings and lack of quality inputs.

B.Sc. (Hons.) Agriculture. Semester – II

PPL-126: Fundamentals of Plant Pathology

Time: 3 Hours **Credit hours per week 4 (3+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students about importance and history of plant disease and various plant pathogens
2. To impart knowledge about growth and reproduction of different plant pathogens and various epidemiological factors

Theory

Section-A: Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology and Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, differentgroups: fungi, bacteria, fastidious vascular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseasescaused by them. Diseases and symptoms due to abiotic causes.

Section-B: Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes. Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction.Viruses: nature,structure, replicationand transmission. Study of phanerogamic plant parasites.

Section-C: Growth and reproduction of plant pathogens. Liberation/dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants.

Section-D: Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

B.Sc. (Hons.) Agriculture. Semester – II

Practical:

Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen. Preparation of media, isolation and Koch's postulates. General study of different structures of fungi. Study of symptoms of various plant diseases. Study of representative fungal genera. Transmission of plant viruses. Study of phanerogamic plant parasites.

Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations.

Suggested Readings-:

Singh RS (2017) Introduction to Principles of Plant Pathology. India: CBS Publishers & Distributors.

AgriosGN (2006) Plant Pathology. India: Elsevier India.

Course Outcomes:

The student will be able:

1. Thorough knowledge to identify diseased plants and study factors affecting disease development.
2. To study about growth and reproduction of plant pathogens.

Knowledge on mode of action and formulation of different fungicides and antibiotics and to know about defense mechanism in plants

B.Sc. (Hons.) Agriculture. Semester – II

ENT-127 Fundamentals of Entomology

Time: 3 Hours **Credit hours per week 4 (3+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

The course aims to:

1. To impart knowledge to the students on morphology and physiology of insects.
2. To impart knowledge on classification and identification of insects based on their morphology.

Theory

Section-A: History of Entomology in India. Classification of phylum Arthropoda upto classes. Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, Special emphasis to orders and families of Agricultural importance like **Orthoptera**: Acrididae, Tettigonidae, Gryllidae; **Dictyoptera**: Mantidae, Blattidae; **Odonata**; **Isoptera**: Termitidae; **Thysanoptera**: Thripidae; **Hemiptera**: Pentatomidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae; **Neuroptera**: Chrysopidae; **Lepidoptera**: Pieridae, Noctuidae, Pyralidae, Gelechiidae, Arctiidae, Bombycidae; **Coleoptera**: Coccinellidae, Chrysomelidae, Curculionidae, Bruchidae; **Hymenoptera**: Tenthridinidae, Apidae, Trichogrammatidae, lchneumonidae, Braconidae; **Diptera**: Cecidomyiidae, Culicidae, Muscidae, Tephritidae.

Section-B: Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure and modifications ofinsect antennae, mouth parts, legs, Wing modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous and reproductive system in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

Section-C: Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors–temperature, moisture, humidity, rainfall, light. Effect of biotic factors – food competition, natural

and environmental resistance. Major points related to dominance of class Insecta in Animal kingdom.Various categories of pests.

Section-D: Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control- importance, hazards and limitations. Recent methods of pest control, repellents, anti feedants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Symptoms of poisoning, first aid and antidotes.

ENT-127 Fundamentals of Entomology

Practical:

Methods of collection and preservation of insects including immature stages; External features of Grasshopper Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations. Pesticide appliances and their maintenance. Sampling techniques for estimation of insect population and damage

Suggested Readings:

Upadhyay K D and *Mathur* Y K (2002) A *Text Book of Entomology*. Aman Publishing House, Meerut, U.P., India.

Borror D J, Triple Horn C A and Johnson N F (1987) An introduction to the study of insects (VI Edition). Horcourt College Publishers, New York.

Tembhare D B (1997) Modern Entomology, Himalaya Publishing House, Mumbai, India.

Srivastava P D and Singh R P (1997) An introduction to Entomology. Concept Publishing Company, New Delhi, India.

Course Outcomes:

The student will be able:

1. to get thorough knowledge of insect collection and preservation.
2. to develop skills for identification of insects.
3. to impart knowledge on physiological systems in insects through dissections.

B.Sc. (Hons.) Agriculture. Semester – II

EXT-128 Fundamentals of Agricultural Extension Education

Time: 3 Hours **Credit hours per week 3(2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

Main objective is to describe the concept of extension education and its role in development of rural community. It also aims at imparting knowledge about new concepts of extension education and describing various methods used to communicate with farmers.

Theory:

Section-A: Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India:

Section-B: Extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP etc.), New trends in agriculture extension, cyber extension/e-extension, expert system etc.Rural Development: concept, meaning, definition; Community Dev.-meaning, definition, concept & principles.

Section-C: Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: extension teaching methods: meaning, classification, individual, group and mass contact methods.

Section-D: Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

B.Sc. (Hons.) Agriculture. Semester – II

Practical:

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; Role of community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

Suggested readings:

1. Dubey V.K.& Bishnoi Indra 2008, Extension Education and Communication, New sage international publishers.
2. Ray GL. 2006. Extension Communication and Management. Kalyani Publications.
3. Supe S.V. 2009 A textbook of Extension Education. Agrotech publishing company, Udaipur.

Course outcomes

1. Detailed Knowledge of Extension Education
2. Detailed Knowledge about rural development and community development programme
3. Impart knowledge about new concepts of cyber extension
4. To acquaint the students with different methods of communication and diffusion of innovation process

B.Sc. (Hons.) Agriculture. Semester – II

DMT-129 Disaster Management

Time: 3 Hours **Credit hours per week: 1 (1+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course Objectives:-

1. Supply of essential commodities
2. Rehabilitation of disaster victims
3. Protective measures to reduce the intensity of future disasters
4. Rescue of victims by the event and disposal of losses suffered
5. Restoration of human life in the region

Theory:

Section-A: Natural Disasters- Meaning and nature of natural disasters, their types and effects. cyclone, avalanches, volcanic eruptions, Heat and cold waves, Man Made Disasters, chemical disasters, biological disasters, building fire,coal fire, forest fire, oil fire

Section-B: Disaster Management- Effect to mitigate natural disaster at national and global levels.International strategy for disaster reduction.

Section-C: Concept of disaster management, national disastermanagement framework; financial arrangements; role of NGOs, community –based organizationsand media.

Section-D: Central, state, district and local administration; Armed forces in disaster response;Disaster response; Police and other organizations.

Suggested Readings:

1. A Text Book of Disaster Mangement by Dr. A. K. Srivastava.
2. A Text Book of Disaster Mangement by Dr. R. Subramanian

Course Outcomes:-

1. Prevention of disasters during the next iteration of the cycle.
2. Mitigate the effects of disaster on people, property and infrastructure.
3. Capacity to obtain, analyze and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

B.Sc. (Hons.) Agriculture. Semester – II

BPBA-1102 **Compulsory Punjabi**

SEMESTER-II

ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

Time: 3 Hours **Credit hours per week 2 (2+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

ਪਾਠ–ਕ੍ਰਮ

ਭਾਗ–ਪਹਿਲਾ

ਸਾਹਿਤਦੇਰੰਗ, ਡਾ. ਮਹਿਲਸਿੰਘ (ਸੰਪਾ.), ਰਵੀਸਾਹਿਤਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।

ਭਾਗਦੂਜਾ – ਵਾਰਤਕਅਤੇਰੇਖਾ–ਚਿੱਤਰ, ਡਾ. ਭੁਪਿੰਦਰਸਿੰਘਅਤੇਡਾ. ਕੁਲਦੀਪਸਿੰਘਢਿੱਲੋਂ (ਸਹਿਸੰਪਾ.)

(ਵਾਰਤਕਭਾਗਵਿਚੋਂਸਾਰ/ਵਿਸ਼ਾ–ਵਸਤੂ। ਰੇਖਾ–ਚਿੱਤਰਭਾਗਵਿਚੋਂਸਾਰ/ਨਾਇਕਬਿੰਬ)

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective

- ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਵਾਰਤਕ ਦੀ ਵਿਧਾ ਨਿਬੰਧ ਅਤੇ ਰੇਖਾ–ਚਿਤਰ ਸੰਬੰਧੀ ਸਮਝ ਪੈਦਾ ਕਰਨੀ।
- ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸੰਬੰਧਿਤ ਵਿਸ਼ੇ ਦੀਆਂ ਪਰਤਾਂ ਨੂੰ ਉਜਾਗਰ ਕਰਨ ਦਾ ਹੁਨਰ ਵਿਕਸਿਤ ਕਰਨਾ।
- ਸ਼ਬਦ ਬਣਤਰ ਤੇ ਸ਼ਬਦ ਰਚਨਾ ਸੰਬੰਧੀ ਜਾਣਕਾਰੀ ਪ੍ਰਦਾਨ ਕਰਨਾ।
- ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਗੁਰਮੁਖੀ ਲਿਪੀ ਦੇ ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ ਬਾਰੇ ਜਾਣਕਾਰੀ ਵਿਕਸਤ ਕਰਨੀ।

ਭਾਗ–ਦੂਜਾ

(ੳ)ਸ਼ਬਦ–ਬਣਤਰਅਤੇਸ਼ਬਦਰਚਨਾ :ਪਰਿਭਾਸ਼ਾ, ਮੁੱਢਲੇਸੰਕਲਪ

(ਅ)ਸ਼ਬਦ–ਸ਼੍ਰੇਣੀਆਂ

ਭਾਗ–ਤੀਜਾ

(ੳ) ਪੰਜਾਬੀਭਾਸ਼ਾਦਾਨਿਕਾਸਤੇਵਿਕਾਸ

(ਅ) ਗੁਰਮੁਖੀਲਿਪੀਦਾਨਿਕਾਸਤੇਵਿਕਾਸ

ਭਾਗ–ਚੌਥਾ

(ੳ) ਦਫ਼ਤਰੀਚਿੱਠੀ–ਪੱਤਰ

(ਅ) ਮੁਹਾਵਰੇਅਤੇਅਖਾਣ

ਅੰਕ–ਵੰਡਅਤੇਪ੍ਰੀਖਿਅਕਲਈਹਦਾਇਤਾਂ

1. ਸਿਲੇਬਸਦੇਚਾਰਭਾਗਹਨ ਪਰ ਪ੍ਰਸ਼ਨ–ਪੱਤਰਦੇਪੰਜਭਾਗਹੋਣਗੇ।
2. ਪਹਿਲੇਚਾਰਭਾਗਾਂਵਿਚ 02–02 ਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇ। ਹਰੇਕਭਾਗਵਿਚੋਂ 01–01 ਪ੍ਰਸ਼ਨਕਰਨਾਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕਪ੍ਰਸ਼ਨਦੇਬਰਾਬਰ (08) ਅੰਕਹੋਣਗੇ।
3. ਪ੍ਰਸ਼ਨਪੱਤਰਦੇਪੰਜਵੇਂਭਾਗਵਿਚਸਾਰੇਸਿਲੇਬਸਵਿਚੋਂ 01–01 ਅੰਕਦੇ ਛੇ ਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇ, ਜਿਨ੍ਹਾਂਵਿਚੋਂ 05 ਪ੍ਰਸ਼ਨਾਂਦੇਉੱਤਰਦੇਣਾਲਾਜ਼ਮੀਹੋਵੇਗਾ।
4. ਪੇਪਰਸੈੱਟਕਰਨਵਾਲਾਜੇਕਰਚਾਹੇਤਾਂਪ੍ਰਸ਼ਨਾਂਦੀਵੰਡਅੱਗੋਂਵੱਧਤੋਂਵੱਧਚਾਰਉਪ–ਪ੍ਰਸ਼ਨਾਂਵਿਚਕਰਸਕਦਾ ਹੈ।

ਨੋਟ : ਇੰਟਰਨਲਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂਦੀਹੈ, ਜੋ ਕਾਲਜਵੱਲੋਂਨਿਰਧਾਰਿਤਦਿਸ਼ਾਨਿਰਦੇਸ਼ਾਂਅਨੁਸਾਰਇਨ੍ਹਾਂਅੰਕਾਂ ਤੋਂਵੱਖਰੀਹੋਵੇਗੀ। ਇਸਪੇਪਰਦੇਕੁੱਲਅੰਕ 37+13 = 50 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)

- ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਸਾਹਿਤਕ ਸਮਝ ਵਿਕਸਤ ਹੋਵੇਗੀ।
- ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀਆਂ ਸੰਭਾਵਨਾਵਾਂ ਪੈਦਾ ਹੋਣਗੀਆਂ।
- ਉਨ੍ਹਾਂ ਨੂੰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਅੰਦਰੂਨੀ ਬਣਤਰ ਦਾ ਗਿਆ ਹਾਸਿਲ ਹੋਵੇਗਾ।
- ਉਨ੍ਹਾਂ ਦੇ ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀਆਂ ਸੰਬੰਧੀ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਹੋਵੇਗਾ।
- ਉਨ੍ਹਾਂ ਦੀ ਗੁਰਮੁਖੀ ਲਿਪੀ ਸੰਬੰਧੀ ਸਮਝ ਵਿਕਸਤ ਹੋਵੇਗੀ।

B.Sc. (Hons.) Agriculture. Semester – II

BPBA-1202 **Basic Punjabi**

ਮੁੱਢਲੀ ਪੰਜਾਬੀ

(In Lieu of Compulsory Punjabi)

Time: 3 Hours **Credit hours per week 2 (2+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਪੰਜਾਬੀਸ਼ਬਦ-ਬਣਤਰ :

ਧਾਤੂ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਮਧੇਤਰ, ਪਿਛੇਤਰ), ਪੰਜਾਬੀਕੋਸ਼ਗਤਸ਼ਬਦਅਤੇਵਿਆਕਰਨਕਸ਼ਬਦ

ਭਾਗ-ਦੂਜਾ

ਪੰਜਾਬੀਸ਼ਬਦ-ਪ੍ਰਕਾਰ :

ਸੰਯੁਕਤਸ਼ਬਦ, ਸਮਾਸੀਸ਼ਬਦ, ਦੋਜਾਤੀਸ਼ਬਦ, ਦੋਹਰੇ/ਦੁਹਰੁਕਤੀਸ਼ਬਦਅਤੇਮਿਸ਼ਰਤਸ਼ਬਦ

ਭਾਗ-ਤੀਜਾ

ਪੰਜਾਬੀਸ਼ਬਦ-ਰਚਨਾ :

ਇਕ-ਵਚਨ/ਬਹੁ-ਵਚਨ, ਲਿੰਗ-ਪੁਲਿੰਗ, ਬਹੁਅਰਥਕਸ਼ਬਦ, ਸਮਾਨਅਰਥਕਸ਼ਬਦ, ਬਹੁਤੇਸ਼ਬਦਾਂਲਈਇਕਸ਼ਬਦ, ਸ਼ਬਦਜੁੱਟ, ਵਿਰੋਧਅਰਥਕਸ਼ਬਦ, ਸਮਨਾਮੀਸ਼ਬਦ

ਭਾਗ-ਚੌਥਾ

ਨਿੱਤਵਰਤੋਂਦੀਪੰਜਾਬੀਸ਼ਬਦਾਵਲੀ

ਖਾਣ-ਪੀਣ, ਸਾਕਾਦਾਰੀ, ਰੁੱਤਾਂ, ਮਹੀਨਿਆਂ, ਗਿਣਤੀ, ਮੌਸਮ, ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਧੰਦਿਆਂਨਾਲਸੰਬੰਧਿਤ

ਅੰਕ-ਵੰਡਅਤੇਪ੍ਰੀਖਿਅਕਲਈਹਦਾਇਤਾਂ

1. ਭਾਗਪਹਿਲਾਵਿਚੋਂਚਾਰਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇਜਿਨ੍ਹਾਂਵਿਚੋਂਤਿੰਨਪ੍ਰਸ਼ਨਾਂਦਾਉੱਤਰਦੇਣਾਲਾਜ਼ਮੀਹੈ। ਹਰ ਪ੍ਰਸ਼ਨਦੇਚਾਰ-ਚਾਰਅੰਕਹਨ । (3x4)=12 **ਅੰਕ**
2. ਭਾਗਦੂਸਰਾਵਿਚੋਂ ਦੋ-ਦੋ ਅੰਕਦੇਪੰਜਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇ। ਸਾਰੇਪ੍ਰਸ਼ਨਲਾਜ਼ਮੀਹਨ। (5x2)=10 **ਅੰਕ**
3. ਭਾਗਤੀਸਰਾਵਿਚੋਂਚਾਰਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇਜਿਨ੍ਹਾਂਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨਹੱਲਕਰਨੇਲਾਜ਼ਮੀਹਨ। **(2x5)=10 ਅੰਕ**
4. ਭਾਗਚੌਥਾਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨਪੁੱਛੇਜਾਣਗੇਜਿਨ੍ਹਾਂਵਿਚੋਂਇਕਪ੍ਰਸ਼ਨਹੱਲਕਰਨਾਹੋਵੇਗਾ। (1x5)=05 **ਅੰਕ**

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective

- ਵਿਦਿਆਰਥੀ ਅੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਸਮਝ ਵਿਕਸਤ ਕਰਨਾ।
- ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਵਿਆਕਰਨਕ ਪ੍ਰਬੰਧ ਸੰਬੰਧੀ ਗਿਆਨ ਕਰਾਉਣਾ।
- ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ ਦੁਆਰਾ ਪੰਜਾਬੀ ਭਾਸ਼ਾ 'ਤੇ ਪਕੜ ਵਧਾਉਣਾ।

ਨੋਟ: ਇੰਟਰਨਲਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂਦੀਹੈ, ਜੋ ਕਾਲਜਵੱਲੋਂਨਿਰਧਾਰਿਤਦਿਸ਼ਾਨਿਰਦੇਸ਼ਾਂਅਨੁਸਾਰਇਨ੍ਹਾਂਅੰਕਾਂ ਤੋਂਵੱਖਰੀਹੋਵੇਗੀ। ਇਸਪੇਪਰਦੇਕੁਲਅੰਕ 37+13 = 50 ਹਨ।

B.Sc. (Hons.) Agriculture. Semester – II

ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)

- ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ ਬਾਰੇ ਸਮਝ ਹੋਰ ਵਿਕਸਿਤ ਹੋਵੇਗੀ।
- ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਿਲ ਕਰ ਭਾਸ਼ਾਈ ਗਿਆਨ ਨੂੰ ਵਿਕਸਿਤ ਕਰਨਗੇ।
- ਪੰਜਾਬੀ ਸ਼ਬਦ-ਰਚਨਾ ਸੰਬੰਧੀ ਜਾਣਕਾਰੀ ਵਿਦਿਆਰਥੀਆਂ ਦੇ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਕਰੇਗੀ।

B.Sc. (Hons.) Agriculture. Semester – II

BPHC-1224: PUNJAB HISTORY & CULTURE (A.D. 1000 to 1799)

(Special Paper in lieu of Punjabi compulsory)

(For those students who are not domicile of Punjab)

Time: 3 Hours **Credit hours per week: 2 (2+0)**

Total Marks: 100

Theory: 75

Internal Assessment: 25

Instructions for the Paper Setters:-

Section–A: The examiner will set 10 questions from the entire syllabus. All questions are compulsory. Answer to each question will be in about 100 words. Each question will carry 1.5 marks. The total weightage of this Section will be 15 marks.

Section B: The examiner will set 8 questions divided into four units. In each unit there will be two questions and the candidate will attempt one question from each unit in about 1000 words. Each question will carry 15 marks. The total weightage of this Section will be 60 marks.

Note: **The Medium of Instruction is English.**

UNIT-I

1. The Sources: Main Categories and their Assessment
2. Society and Culture of the Punjab during Turko-Afghan Rule
3. The Punjab under the Mughals

UNIT-II

4. Bhakti Movement and its impact on the Society of the Punjab.
5. Sufism in the Punjab with special reference to Baba Farid.
6. Guru Nanak Dev : Life, Teachings and Travels.

Unit-III

7. Development of the Sikh Panth: Guru Angad Dev to Guru Arjan Dev
8. Transformation of the Sikh Panth : Guru Hargobind to Guru Tegh Bahadur
9. Creation of the Khalsa and its impact on the Punjab

Unit-IV

10. Rise of the Misls.
11. Rise of Banda Bahadur and his achievements.
12. Art , Architecture, Folk Music, Fair and Festivals in the Punjab during the medieval period.

Suggested Readings:-

1. P.N. Chopra, B.N. Puri, & M.N Das, A Social, Cultural & Economic History of India-Vol. II., Macmillan India, New Delhi, 1974.
2. J.S Grewal, The Sikhs of the Punjab, Cambridge University Press, New Delhi, 1994.
3. Fauja Singh,A History of the Sikhs-Vol. I & II, Punjabi University, Patiala, 1972.
4. Kushwant Singh, A History of the Sikhs-Vol. I (1469-1839),Oxford University Press, New Delhi, 2011.
5. Kirpal Singh, History and Culture of the Punjab-Part II (Medieval Period), Publication Bureau, Punjabi University, Patiala, 1990.

B.Sc. (Hons.) Agriculture. Semester – II

***BDA-121 Drug Abuse: Problem, Management and Prevention**

Time: 3 Hours **Credit hours per week 1(1+0) NC**

Max. Marks: 100

Theory: 100

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 20 marks (comprising of 10 short answer type questions of 2 marks each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (20).

UNIT-I

- **Prevention of Drug abuse**

  Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active scrutiny.

UNIT-II

- **School:**Counseling, Teacher as role-model, Parent-Teacher-Health Professional Coordination, Random testing on students.

UNIT-III

- **Controlling Drug Abuse**

  Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and Awareness Program

UNIT-IV

- **Legislation:** NDPS Act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

B.Sc. (Hons.) Agriculture. Semester – II

***BPED-1211 Physical Education**

Credit hours per week: 2 (0+2) NC
Max. Marks: 100
Practical: 100
Non Credited: S/US

- **Athletics Performance:** 100 Mtr race: 5 marks, Shot-put: 5 marks, Long jump: 5 marks (15 marks)
- **Game (Boys & Girls):** Fundamentals, Rules Performance (25 marks)
  Athletic, Football, Hockey, Volleyball, Cricket (5 marks each game)
- **Viva:** (20 marks)
- **Practical File:** (20 marks)
- **Specific Game Performance:** (20 marks)
  Any one: 20 marks (20-International, 18- National medalist,
  15-National participation, 12-State/Inter-college position, 10 State/Inter-college participation)

***BYOG-1211 (Yoga)**

- **Viva:** Introduction and importance of Yoga, Main principle of yoga, Types of yoga (15 marks)
- **Practical file:** (10 marks)
- **Yogic Asana:** Meditative poses (Padma, Vajra, SukhAsanas) (20 marks)
  Cultural poses (Halasan, Sarvangasana, Bhujangasna, Salbhasana, Dhanurasana, Chakarasana) (20 marks)
- **Shudhi Kirya:** Jal neti, Nauli, Kapalbhati (15 marks)
- **Pranayam:** Surajbhedi, Ujjaiee, Shitkari, Bharmari, Shitli, (20 marks)
  Bhastrika, Kapalbhati

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***NCC-1211** **(National Cadet Corps)**

Credit hours/week: 2 (0+2)
Max. Marks: 100
Practical: 100
Non Credited: S/US

Section A **25 marks**

Leadership traits, types of leadership. Character/personality development. Civil defense organization, types of emergencies, fire fighting, protection, Maintenance of essential services, disaster management, aid during development projects.

Section B **25 marks**

Basics of social service, weaker sections of society and their needs, NGO's and their contribution, contribution of youth towards social welfare and family planning.

Section C **25 marks**

Structure and function of human body, diet and exercise, hygiene and sanitation. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health.

Section D **25 marks**

Basic principles of ecology, environmental conservation, pollution and its control. Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self defense.

B.Sc. (Hons.) Agriculture. Semester – II

***NSS-1211** **(National Service scheme)**

Credit hours/week: 2 (0+2) NC
Max. Marks: 100
Practical: 100
Non Credited: S/US

Section A **25 marks**

Importance and role of youth leadership: Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership

Life competencies: Definition and importance of life competencies, problem-solving and decision-making, inter personal communication

Section B **25 marks**

Youth development programmes: Development of youth programmes and policy at the national level, state level and voluntary sector; youth-focused and youth-led organisations

Section C **25 marks**

Health, hygiene and sanitation: Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health.

Section D **25 marks**

Youth health, lifestyle, HIV AIDS and first aid: Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid

B.Sc. (Hons.) Agriculture. Semester – III

AGR-211: Crop Production Technology-I (*Kharif* Crops)

Time: 3 Hours **Credit hours per week 2(1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:-

1. To know origin, distribution, economic importance soil and climatic requirements, varieties, cultural practices and yield of *Kharif crops*.
2. Practical knowledge the package of practices of various food and forage crops

Theory:

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

Section-A: Cereals – rice, maize, sorghum, pearl millet and finger millet,

Section-B: Pulses-pigeonpea, mungbean and urdbean;

Section-C: Oilseeds- groundnut, and soybean; fibre crops- cotton & Jute;

Section-D: Forage crops-sorghum, cowpea, cluster bean and napier.

Practical:

Rice nursery preparation and transplanting of rice. Sowing of soybean, pigeonpea, mungbean, maize, groundnut and cotton. Effect of seed size on germination and seedling vigour of *kharif* season crops, effect of sowing depth on germination of *kharif* crops, 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. study of forage experiments, morphological description of *kharif* season crops, visit to research centres of related crops.

Suggested Books:-

- Weed Management: US Walia (Kalyani Publishers)
- Principles of Agronomy: T Yellamanda Reddy and GH Sankara Reddy (Kalyani Publishers)
- Package of Practices for *Rabi*- (Published by- PAU Ludhiana)
- Agronomy of Fodder and Forage Crops: SC Panda (Kalyani Publishers)

Course Outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Know the origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops.
CO2	Identify weeds in Rabi season crops, pulses-chickpea, lentil, peas; oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane, medicinal and aromatic crops-mentha, lemongrass and citronella, forage crops-berseem, lucerne and oat.
CO3	Get knowledge on irrigation scheduling in Rabi crops, additional area can be Increased of low water requiring crops.
CO4	Know about basic morphological characteristics of Rabi crops.

B.Sc. (Hons.) Agriculture. Semester – III

AGE-212 Agricultural Marketing, Trade and Prices

Time: 3 Hours **Credit hours per week 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives-

To make student aware about the subject of agricultural marketing includes marketing functions , agencies, channels, efficiency and cost , price spread ,producer surplus, marketing institutions, govt. policies and research, Import-exports of agricultural commodities etc. Creation of state wide agricultural produce marketing infrastructure, profit maximization for farmer by ensuring best possible prices for their produce. Regulation and administration of various market committees all across the state as per the Punjab agricultural produce market act 1961.

Theory:

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

Section-B: 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:

Section-C: 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;

Section-D: 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. GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical:

Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; 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.

Suggested Readings:

S.S Acharya and N.L Agarawal2004.*Agricultural Marketing in India.* Oxford and IBH Publishing company Pvt. Ltd. New Delhi.

S S Acharya and N.L Agarawal.1994. Agricultural Prices Analysis and Policy. Oxford and IBH Publishing company Pvt. Ltd. New Delhi.

R.L.Kohls and J.U Uhj. 2012. *Marketing of Agricultural products*.

Course Outcomes:-

1. Detailed knowledge on agricultural marketing, Meaning, structure, types and functions of agricultural markets.
2. Marketing mix and market segmentation, characteristics of agriculture markets.
3. Learn how agricultural marketing system affect the farmers, consumers and intermediaries.
4. Develop strategies through which the dynamic market systems will response to create a win-win situation.
5. Appreciate the possible changes in the agriculture input, output and food market

B.Sc. (Hons.) Agriculture. Semester – III

AGE-213: Agricultural Finance and Co-Operation

Time: 3 Hours **Credit hours per week 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Internal Assessment: 25Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives-

To impart knowledge and expertise in the field of finance, enable the students to understand the business planning and financial management of an agri-business.

Theory

Section-A: 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.

Section-B: 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.

Section-C: An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank.Preparation and analysis of financial statements – Balance Sheet and Income Statement.Basic guidelines for preparation of project reports.

Section-D: Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

Practical

Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Estimation of credit requirement of farm business – A case study.Preparation and analysis of balance sheet – A case study.Preparation and analysis of income statement – A case study.Appraisal of a loan proposal – A case study.

Suggested readings

S Subba Ready & P Raghu Ram. Agricultural Finance and Management. Oxford and IBH Publishing Co Ltd.

E Die Sollem H and Heady EO. (Ed.). *Capital and Credit Needs in Changing Agriculture*, Bauman.

Hopkins A Barry, Peter Jo and Baker CB. *Financial Management in Agriculture*.

Murray WG and Nelson AG. 1960. *Agricultural Finance.* Iowa State University

Chanona C. 1969. *Agricultural Finance in India: Role of Commercial Banks*. Marketing and Economics Research Bureau, New Delhi.

Gittinger JP. 1972. *Economic analysis of agricultural projects*, John Hopkins Univ. Press, Baltimore.

Little IMD and JA Mirrless. 1974, *Project appraisal and planning for developing countries*, Oxford and IBH publishing Co. New Delhi.

Arnold CH. 1972. *Project Evaluation, collected papers*, Macmillan.

Course Outcomes:-

1. Detailed knowledge on Agricultural finance-meaning, scope and sihnificance, credit needs and its role in Indian agriculture.
2. Agriculture credit acquisition appraisal and institutional framework in credit provision.
3. Agricultural cooperation: Meaning, history and development and significance of cooperative movement in India.
4. Understand history of financing agriculture in India.

B.Sc. (Hons.) Agriculture. Semester – III

FSC-214: Production Technology for Fruit and Plantation Crops

Time: 3 Hours **Credit hours per week 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

This course aims at the identification of fruit and plantation crops along with their importance ; Knowledge about their propagation by the adoption of various cultural and management practices ; Recognition of insect-pest and their management to produce the superior mass production.

Theory:

Section-A: Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks;

Section-B: Production technologies for the cultivation of major fruits-mango, citrus, grape, plum, almond, guava, litchi, papaya, pear, peach

Section-C: Minor fruits- pineapple, pomegranate, jackfruit, strawberry,

Section-D: Plantation Crops:Cashew, tea, coffee.

Practical:

Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops including Micro-propagation. Description and identification of fruit. Preparation of plant bio regulators and their uses, Identification of Pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchard.

Suggested Readings :

1.Jitendra Singh (2018) *Basic Horticulture*. Kalyani Publishers.

2. J.S. Bal (2016) *Fruit growing*. Kalyani Publishers.

3.Package of Practices for Cultivation of Fruits. PAU Ludhiana.

4.Dr. Bijendra Singh, Dr. Aakansha Goswami (2015) *Fundamentals of Horticulture*. Kalyani Publishers.

5.Dr. T.D.Pandey, Dr. S.K.Verma (2019) *Fundamentals of Horticulture*. Kushal Publications and Distributors .

Course outcomes:

After the completion of the course the students will be able to :

1. Know the importance of different fruit crops and plantation crops.
2. Understand canopy architecture for higher productivity in mango and grapes.
3. Learn package of practices for the major crops like mango, banana, guava, lemon, pineapple, coffee, coconut and rubber.
4. Adopt the concept of high density planting in different fruit crops.

B.Sc. (Hons.) Agriculture. Semester – III

AEN-215 **Farm Machinery and Power**

Time: 3 Hours **Credit hours per week 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives: To make the students aware about working of farm tractor including its various systems. To disseminate knowledge about working of various primary and secondary tillage implements, machines used for sowing/planting of crops and harvesting equipment.

Theory:-

Section-A: 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.
Section-B: Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor.
Section-C: 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,
Section-D: Familiarization with Primary and Secondary Tillage implement, 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.

Practicals

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow. Familiarization with seed cum- fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery.

Suggested Readings

· Principles of Agricultural Engineering Vol. 1. Reprint Edition: 2012. by T. P. Ojha, A. M. Michael, Jain Brothers, New Delhi

· Elements of Agricultural Engineering by Jagadishwar Sahay. Forth Edition, 2010 Standard Distributor and Publishers, New Delhi

· Agricultural Engineering by O P Singhal (2011) Aman Publishing House, Meerut

Course Outcomes:

- Gain understanding of working of 2 and 4 stroke engines/ petrol and diesel engines.
- Know the working of different components of a farm tractor i.e. transmission system, steering and braking system, hydraulic system and PTO.
- Students are able to calibrate a seed drill.
- Acquire knowledge about different farm machinery for crop sowing, harvesting, threshing and plant protection.

B.Sc. (Hons.) Agriculture. Semester – III

VSC-216: Production Technology for Vegetables and Spices

Time: 3 Hours **Credit hours per week 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

1. To impart knowledge of basic concept of vegetable production.
2. To create awareness about the different physiological disorder of vegetables
3. Knowledge about nutrition requirement for vegetables.
4. To give knowledge about growth regulators in vegetable production .

Theory:

Importance of vegetables & spices in human nutrition and national economy, brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important vegetable groups:

Section-A: Solanaceous crops (Tomato, Brinjal, Chilli), Cole crops (Cauliflower, Cabbage) and Okra.

Section-B: Cucurbitaceaeous crops (Cucumber, Muskmelon, Pumpkin, Bitter gourd), Root crops (Carrot, Raddish)

Section-C: Bulb crops (Onion, Garlic), Tuber crops (Potato, Sweet Potato).

Section-D: Leafy vegetables (Palak, Amaranthus), Spices (Ginger, Cardamom, Fenugreek, Coriander).

Practical:

Identification of vegetables & spices crops and their seeds. Raising of nursery of vegetables & spice crops. Sowing of different vegetable and spice crops. Transplanting of vegetable and spice seedling in main field, Interculture operations in field plots. Seed production in vegetable crops,

seed extraction in tomato and brinjal, harvesting, grading and packaging of vegetable and spices, economics of vegetables and spices cultivation, visit to commercial vegetable farm.

Suggested Reading:

1. Bose TK, Kabir J, Maity TK, Parthasarathy VA and Som MG. 2003. Vegetable crops. Vols. I-III. Naya udyog.
2. Bose TK, Som MG and Kabir J. (Eds.). 1993. Vegetable crops. Naya prokash.
3. Chadha KL and Kalloo G. (Eds.). 1993-94. Advances in horticulture Vols. V-X. Malhotra publ. house.
4. Chadha KL. (Ed.). 2002. Hand book of horticulture. ICAR.
5. Chauhan DVS. (Ed.). 1986. Vegetable production in India. Ram prasad and sons.
6. Fageria MS, Choudhary BR and Dhaka RS. 2000. Vegetable crops: production technology. Vol.II. Kalyani.
7. Gopalakrishanan TR. 2007. Vegetable crops. New India publ. agency.
8. Hazra P and Banerjee MK and Chattopadhyay A. 2012. Varieties of vegetable crops in India, (Second edition), Kalyani publishers, Ludhiana, 199 p.
9. Hazra P. 2016. Vegetable science. 2ndedn, Kalyani publishers, Ludhiana.
10. Hazra P. 2019. Vegetable production and technology. New India publishing agency, New Delhi.

Course outcomes:

After the completion of the course the students will be able to**:**

1. Have the practical knowledge on various production techniques of vegetables and spices.
2. Learn the importance of vegetables and spices in human nutrition
3. Understand the quality of produce and its maintenance.
4. Manage skill for solving field problems.

B.Sc. (Hons.) Agriculture. Semester – III

AGI-217 Agri-Informatics

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

- To impart knowledge of basic concepts of computer applications.
- To define the role of e- Agriculture
- Knowledge about Computer Models for understanding plant processes
- To give knowledge about decision support systems in Agriculture,

Theory:

Section-A: Introduction to Computers, Operating Systems, definition and types, Applications of MS-Office for document creation & editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions,

Section-B: 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.

Section-C: e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.. (31.8.2022) extra add- 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 advices, market price, postharvest management etc. Geospatial technology for generating valuable agri-information.

Section-D: 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

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management.

B.Sc. (Hons.) Agriculture. Semester – III

Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. MS-EXCEL - Creating a spread sheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW). Introduction of programming languages. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Hands on Decision Support System. Preparation of contingent crop planning.

Suggested Reading:

1. A text book on agri-informatics: Amit A. Deogirikar, Sanchali Kshirsagar
2. Introductory agri-informatics: Subrat Kumar Mahapatra, Prof. (Dr.) Prasannajit Mishra, Jayashankar Pradhan

Course outcomes:

After the completion of the course the students will be able to**:**

- Have the hands-on skills of different computer applications .
- Learn the role of crop simulation models in Indian agriculture
- Creating a spreadsheet, use of statistical tools, writing expressions

B.Sc. (Hons.) Agriculture. Semester – III

PBG-218 Principles of Seed Technology

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objective:

1. The student will learn about the principles and production of seed technology
2. Knowledge about the seed act and powers of seed inspector
3. The student will get acquainted about seed marketing structures

Theory:

Section-A: 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- Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

Section-B: 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, 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.

Section-C: 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.

Section-D: 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:

- Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi.
- Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea.
- Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard.

- Seed production in important vegetable crops: Solanaceous, Cruciferous, Malvaceous, Amaryllidaceous and Cucurbitaceous
- Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test.
- Genetic purity test: Grow out test.
- Seed certification: Procedure, Field inspection and preparation of field inspection report.

Suggested readings:

1. Seed Technology by R.L. Aggarwal
2. Principles of seed technology by P.K. Upadhyay

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Know in detail about seed production of various crops
CO2	Use of seed storage and various tests of seed
CO3	Study about management and role of private sector in seed production and marketing strategies

B.Sc. (Hons.) Agriculture. Semester – III

AEN-219 Soil and Water Conservation Engineering

Time: 3 Hours **Credit hours per week: 1 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

· To acquaint students about the importance of application of soil and water conservation measures on farm level. To inculcate in students detailed knowledge of engineering measures employed against erosion.

Theory:

Section-A:

1) Soil Erosion Principles (causes, definition and agents of soil erosion)
2) Water erosion and Factors affecting water erosion.
3) Types of water erosion (Raindrop, sheet, rill and gully erosion)

Section-B:

4) Gully classification
5) Gully control measures
6) Water harvesting and its techniques.

Section-C:

7) Wind erosion and mechanics of wind erosion.
8) Factors affecting wind erosion and types of soil movement.
9) Principle of Wind erosion and its control measures

Section-D:

10) Universal Soil loss Equation and soil loss measure techniques.
11) Conservation measure for hill slopes (contour bund, graded bund and bench terries)
12) Conservation measures for agricultural lands (contouring and stript contouring)

Practical:

1) General Status of Soil Conservation in India
2) Calculation of erosion index

3) Estimation of soil loss
4) Design of contour bunds
5) Design of graded bunds
6) Design of bench terracing system
7) Problems on wind erosion

Suggested Readings

1) · Principles of Agril. Engg.- Vol – II by A. M. Michael& T. P. Ojha (2011), Jain Brothers, New Delhi
2) · Irrigation Theory and Practice By A. M. Michael (2005), Vikas Publishing House Pvt Ltd, New Delhi

Course Outcomes:

- Gain knowledge about soil erosion and consequences of erosion.
- Understand and label contour maps
- Design engineering measures of bunding and terraces
- Design and develop water harvesting structures

B.Sc. (Hons.) Agriculture. Semester – III

ESL-2110 **Environmental Studies**

Time: 3 Hours **Credit hours per week: 4 (3+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10)

Course Objectives:-1) Creating the awareness about environmental problems among people 2) Imparting basic knowledge about the environment and its allied problems
3) Developing an attitude of concern for the environment

Section-A

The multidisciplinary nature of environmental studies:

Definition, scope and its importance

Need for public awareness.

Natural resources:

Natural resources and associated problems:

(a) Forest resources:

Use and over exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests 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 on modern agriculture, fertilizer-pesticide problem, salinity, case studies.

(e) Energy Resources:

Growing of energy needs, renewable and non-renewable energy resources, use of alternate energy sources, case studies.

(f) Land Resources:

Land as a resource, land degradation, soil erosion and desertification.

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

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Section-B

Ecosystem:

- 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 following ecosystem:

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Social issues and Environment:

- From unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions.
- Climate change, global warning, acid rain, ozone layer depletion, nuclear accidents and holo cause. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environmental Protection Acts:
    - 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.

Section-C

Biodiversity and its Conservation:

- Definition: Genetic, species and ecosystem diversity.
- Bio-geographical 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 mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity.

6. Environmental Pollution:

Definition, causes, 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
h) Electronic Waste

- Solid waste management: Causes, effects and control measures of urban and industrial wastes
- Role of an individual in prevention of pollution
- Pollution case studies

Section-D

Human Population and 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. Case studies.
- Road Safety Rules & Regulations.
- Accident & First Aid:
- First Aid to Road Accident Victims, Calling Patrolling Police & Ambulance.

Practical:

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

Suggested Readings:

1. A Text Book of Environment Science by Dr. Arun Kumari Nakkella.
2. A Text Book of Environment Science by Dr. Satwinder Kaur

Course Outcomes:-

1. Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross-cultural and historical context of environmental issues and the links between human and natural systems.

B.Sc. (Hons.) Agriculture. Semester – III

***HVE-2111 Human Values and Ethics**

Time: 3 Hours **Credit hours per week: 1 (1+0) NC**

Max. Marks: 100

Theory: 100

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question (Comprising of 10 short answer type questions of 2 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (20).

Course Objectives:

1. To inculcate in human values, morality and good behavior towards the society in the students.
2. To aware students about their rights and duties in the society.

Theory

Section-A: Universal human aspirations: Happiness and prosperity; Human values and ethics: Concept, definition, significance and sources; Fundamental values: Right conduct, peace, truth, love and non-violence;

Section-B: Ethics: professional, environmental, ICT; Sensitization towards others particularly senior citizens, developmentally challenged and gender.

Section-C: Spirituality, positive attitude and scientific temper; Team work and volunteering; Rights and responsibilities; Road safety; Human relations and family harmony;

Section-D: Modern challenges and value conflict: Sensitization against drug abuse and other social evils; Developing personal code of conduct (SWOT Analysis); Management of anger and stress.

Suggested Readings:

1. Human value and Professional ethics by B. S Raghavan, S. Chand and Company Ltd.
2. Human value and Professional ethics by Smriti srivastava, S.K Kataria and Sons.
3. Human value and Professional ethics by Premvir Kapoor, Khanna Publisher
4. Human value and ethics by De babrata Basu and Samarpan Chakraborty

Course Outcomes

On completing the course, the students will be able to:
Learn about human values, morality and good behavior towards the society
know their rights and duties in the society
Learn about management of anger and stress

B.Sc. (Hons.) Agriculture. Semester – IV

AGR-221 Crop Production Technology-II (*Rabi* crops)

Time: 3 Hours **Credit hours per week: 2 (1+1)**
Max. Marks: 100
Theory: 50
Practical: 25
Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

- To know the Origin, geographical distribution, soil and climatic requirements, of *Rabi* crops .
- To gain practical knowledge of raising, harvesting, threshing, processing and storage of different *Rabi* seasons crops.
- To know about efficient use of production inputs.
- To understand economics of raising different crops.

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *rabi* crops as per section:

Section-A: Cereals –wheat and barley, pulses-chickpea, lentil, peas,

Section-B: Oilseeds-rapeseed, mustard and sunflower;

Section-C: Sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella,

Section-D: Forage crops-berseem, lucerne and oat.

Practical:

Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops, study of morphological characteristics of *rabi* crops, study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of

rabi crops at experimental farms. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

Suggested Books:-

- Weed Management: US Walia (Kalyani Publishers)
- Principles of Agronomy: T Yellamanda Reddy and GH Sankara Reddy (Kalyani Publishers)
- Package of Practices for *Rabi*- (Published by- PAU Ludhiana)
- Agronomy of Fodder and Forage Crops: SC Panda (Kalyani Publishers)

Course Outcomes:-

Sr.No.	On completing the course, the students will be able to:
CO1	Know the origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops.
CO2	Identify weeds in Rabi season crops, pulses-chickpea, lentil, peas; oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane, medicinal and aromatic crops-mentha, lemongrass and citronella, forage crops-berseem, lucerne and oat.
CO3	Get knowledge on irrigation scheduling in Rabi crops, additional area can be Increased of low water requiring crops.
CO4	Know about basic morphological characteristics of Rabi crops.

B.Sc. (Hons.) Agriculture. Semester – IV

FSC-222 Production Technology for Ornamental Crops, MAP and Landscaping

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

The main objective of this subject is to acquaint the students with the production technology of ornamental crops, MAPs and Landscaping ; To train the students regarding various cultural practices to be adopted in their cultivation.

Theory

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

Section-B: Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

Section-C: 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

Section-D: Aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rosegeranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Practical

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

Suggested Readings :

1. Bose T.K.1999. *Floriculture and Landscaping*. Naya Prakash, Kolkatta.

2. Bose, T.K. and Yadav, L.P. 1992. *Commercial Flowers*. Naya Prakash, Kolkatta

3. Chattopadhyay,S.K. 2007. *Commercial Floriculture*. Gene-Tech Books, New Delhi
4. Srivastava,H.C.2014.*Medicinal and Aromatic Plants*, ICAR, New Delhi.

Course Outcomes :
After completion of the course the students will be able to:

Sr. No.	On completing the course, the students will be able to:
CO1	Evaluate natural herbal products from an economic perspective.
CO2	Learn the technique of using medicinal and aromatic herbs sustainably
CO3	Set up business related to medicinal, aromatic and landscaping
CO4	Develop effective ideas related to collecting, processing and marketing herbal natural sources.

B.Sc. (Hons.) Agriculture. Semester – IV

AEN-223 Renewable Energy and Green Technology

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives: The aim of this course is to understand the importance of renewable sources of energy in the farm sector. To keep the students abreast with latest interventions that can be used on farm for optimum utilization of available biomass

Theory:

Section-A: Classification of energy sources and their contribution in Agricultural sector.Briquetts and uses of briquettes.

Section-B: Biomass utilization for bio-fuel production and their application , Biogas, Bio-alcohol, Biodiesel and bio-oil production and their utilization as bio-energy resources,

Section-C: Introduction to solar energy, Collection and their applications,Solar energy Gadgets, Solar cooker, solar water heater,

Section-D: Application of Solar Energy;Solar drying , Solar pond, Solar pump, Solar distillation, Solar photovoltaic system and their application. Introduction to wind energy, types and their application.

Practical:

1. To study biogas plants.
2. To study Gasifiers.
3. To study the production process of bio diesel.
4. To study briquetting machine.
5. To study the production process of bio-fuels.
6. To study soar cooker.
7. To study solar drying system.
8. To study solar distillation.
9. To study the performance of wind mill.

Suggested Readings

- Non-conventional Energy Sources by G. D Rai 5th Edition. Khanna Pubhishers, Delhi
- Renewable Energy Theory and Practice by N.S. Rathore, N.L. Panwar, A.K. Kurchania. Himanshu Publications, Udaipur

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the working of non-conventional energy resources and compare them with various conventional energy systems
CO2	Understand the solar energy with respect to applications like - heating, cooling, desalination, power generation, drying, cooking.
CO3	Understand about types and working of Biogas Plants
CO4	Understand about wind energy and the various techniques used in energy generation.

B.Sc. (Hons.) Agriculture. Semester – IV

SSC-224 Problematic Soils and Their Management

Time: 3 Hours **Credit hours per week: 2 (2+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 marks each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course Objectives:

- Students will know details about soil quality & health, types and distribution of different problematic soil.
- Use of different reclamation and management techniques for problematic soils, bioremediation, use of Remote sensing and GIS techniques in diagnosis.
- Study about management of problematic soils, land use capability and classification, land suitability classification and irrigation quality.

Theory:

Section-A: Soil quality and health, Distribution of Waste land and problem soils in India,their Categorization based on properties. Problematic soils under different Agro-ecosystems.

Section-B: Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.Multipurpose tree species, bio remediation through MPTs of soils.

Section-C: Remote sensing and GIS in diagnosis and management of problem soils.land capability and classification, land suitability classification.

Section-D: Irrigation water – quality and standards, utilization of saline water in agriculture.

REFERENCES		
Sr. No.	**Books**	**Authors**
1.	A Text Book of Pedology: Concept and Applications	J. Sehgal
2.	Soil at a Glance	V.N. Sahai
3.	Introductory Soil Science	D.K. Das
4.	Problematic Soils & Their Management ICAR	D.K. Das

B.Sc. (Hons.) Agriculture. Semester – IV

Course outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Know in detail about soil quality & health, types and distribution of different problematic soils.
CO2	Use different reclamation and management techniques for problematic soils, bio-remediation, use of Remote sensing and GIS techniques in diagnosis.
CO3	Study about management of problematic soils, land use capability and classification, land suitability classification and irrigation quality.

B.Sc. (Hons.) Agriculture. Semester – IV

LPM-225 Livestock and Poultry Management

Time: 3 Hours **Credit hours per week: 4 (3+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

1. To get students acquainted with different animals, their habits and habitat.
2. To guide farmers about various problems they face with livestock and their management so that they can get maximum from that.

Theory:

Section-A: Role of livestock in the national economy. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry.

Section B: Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Section C: 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.

Section D: Reproduction in farm animals and poultry. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical's

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. Judging of cattle, buffalo and poultry.
5. Culling of livestock and poultry.
6. Planning and layout of housing for different types of livestock.
7. Computation of rations for livestock. Formulation of concentrate mixtures.

8. 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.

Suggested Readings:

1. A Tect Book of Livestock Production Management by Dr. Usha Subramani and Dr. Nilotpal Ghosh.
2. A Text Book of Animal Husbandry by Dr. G.C Banerjee.

Course Outcomes:

On completing the course, the students will be able to:
Get themselves acquainted with different animals, their habits and habitat.
Guide farmers about various problems they face with livestock and their management so that they can get maximum from that.

B.Sc. (Hons.) Agriculture. Semester – IV

STA-226: **Statistical Methods**

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

- To enables the students to know basics of statistics and its applications in Agriculture. It enables them to represent agriculture data with various graphs. In this course students learn to find measures of central tendency and dispersion of data.
- To enables the students to find out relationship (correlation) between variables and the impact of variables (Regression) on other variables.
- To enables the students to do comparison of means, independency of attributes for only two attributes.
- To enables the students to do comparison of several means by Analysis of Variance technique. Also they are introduced to sampling methods, difference between sampling and complete enumeration and simple random sampling with and without replacements.

Theory:

Section-A: Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency

Section-B: Dispersion, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Section-C: 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.

Section-D: 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,

Practical

B.Sc. (Hons.) Agriculture. Semester – IV

Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles& Percentiles. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles& Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2 ·2 contingency table. Analysis of Variance One Way Classification. Analysis of one way.

Suggested Readings

- Gupta, S.C., Fundamentals of Statistics, 7th Edition, Himalaya Publishing House.
- R. Rangaswamy, A Textbook of Agricultural Statistics, 3rd Edition, New Age International Publishers.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Get knowledge about various statistical techniques and their application in agriculture
CO2	Study various tests of significance and analysis of variance.

B.Sc. (Hons.) Agriculture. Semester – IV

AGR- 227 Farming System and Sustainable Agriculture

Time: 3 Hours **Credit hours per week: 1 (1+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course Objectives:-

1. To understand concept of farming system its scope, types and its components.
2. To study the interactions between different components of integrated farming system.
3. To find suitable farming systems according to geographical situation.
4. To understand role of integrated farming system in sustainable agriculture.

Theory:

Section-A: Farming System scope, importance, and concept, Types of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation,

Section-B: Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; 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,

Section-C: 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,

Section-D: 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.

Suggested books:-Agronomic Research Towards Sustainable Agriculture: Published by- Indian Society of Agronomy

- Modern Concepts of Agronomy: Published by- Indian Society of Agronomy
- Principles of Crop Production: SR Reddy (Kalyani Publishers)

- Farming for the Future: Coen Reijntjes, Bertus Haverkort and Ann Waters- Bayer (Published by- Macmillan)
- Organic Crop Production: Sohan Singh Walia (Published by- PAU Ludhiana)
  Principles and Practices of Agronomy **Authors** P. Balasubramaniyan and SP. Palaniappan **Publisher**: Agrobios (India)

Suggested books:-Agronomic Research Towards Sustainable Agriculture: Published by- Indian Society of Agronomy

- Modern Concepts of Agronomy: Published by- Indian Society of Agronomy
- Principles of Crop Production: SR Reddy (Kalyani Publishers)
- Farming for the Future: Coen Reijntjes, Bertus Haverkort and Ann Waters- Bayer (Published by- Macmillan)
- Organic Crop Production: Sohan Singh Walia (Published by- PAU Ludhiana)
  Principles and Practices of Agronomy **Authors** P. Balasubramaniyan and SP. Palaniappan **Publisher**: Agrobios (India)

Course Outcomes:-

Sr. No.	**On completing the course, the students will be able to:**
CO1	Explain the major aspects of agricultural practices and traditions through time and throughout the world.
CO2	Explain in general the relationships among culture, economics, politics, science, and agricultural development
CO3	Understand the cross-cultural interactions and exchange that link people together and facilitate agricultural development .

B.Sc. (Hons.) Agriculture. Semester – IV

PBG- 228: Fundamentals of Plant Breeding

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the Paper Setters:

5. Question paper should be set strictly according to the syllabus.
6. The language of questions should be straight & simple.
7. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
8. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

1. The student will get the information about the floral structure and emasculation of various crop plants
2. Study on breeding methods of self and cross pollinated crops
3. Acquainted with the information of using biotechnological methods

Theory:

Section-A: Historical development, concept, nature and role of plant breeding, major achievements and future prospects;modes of reproduction and apomixis, self – incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization, introduction; Centres of origin/diversity,

Section-B: Genetics in relation to plant breeding, 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. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops,modes of selection;

Section-C: Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding;

Section-D: Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and Farmer's Rights.

Practical

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

Suggested readings:

1. Principles of Plant Breeding by B.D. Singh
2. Plant Breeding by Phundan Singh

Course outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Get knowledge on basic concepts of plant breeding, modes of reproduction, traditional and modern methods of plant breeding and IPR.
CO2	Study about biotechnology tools- DNA markers assisted selection.

B.Sc. (Hons.) Agriculture. Semester – IV

AGM-229: Introductory Agro-meteorology & Climate Change

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:-

1. To understand roles of agrometeorology in agriculture and its relation to other areas ofagriculture
2. To acquaint with recent developments in agrometeorology with historicaldevelopment of climate change.
3. Studies the behavior of the weather elements that have direct relevanceto agriculture and their effect on crop production.

Theory: Meaning and scope of agricultural meteorology.

Section-A: 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; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo;

Section-B: Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; 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,

Section-C: Cloud formation and classification; Artificial rain making. 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.

Section-D: Agriculture and weather relations; Modifications of crop micro climate, climatic normals 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:

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its estimation using

Planck's intensity law. Measurement of albedo and sunshine duration, computation of radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of windrose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Suggested Books:-

Fundamentals of Agrometeorology: GS Mahi and PK Kingra (Kalyani Publishers)

Fundamentals of Agrometeorology and Climate Change GS Mahi and PK Kingra (Kalyani Publishers

Climate Resilient Agronomy: Published by- Indian Society of Agronomy

Handbook of Agriculture: Directorate of Information and Publication of Agriculture – ICAR

Course Outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Understand roles of agro meteorology in agriculture and its relation to other areas of agriculture to get acquainted with recent developments in agro meteorology along with historical development of climate change.
CO2	Study about agro meteorology or agricultural meteorological and hydrological factors in relation to agriculture.
CO3	Study the behavior of the weather elements that have direct relevance to agriculture and their effect on crop production.
CO4	Understand weather and climate related factors determining the success or failure of agriculture

B.Sc. (Hons.) Agriculture. Semester – IV

ACH-2210 Agrochemicals

Time: 3 Hours **Credit hours per week: 3 (2+1)**
Max. Marks: 100
Theory: 50
Practical: 25
Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

1. To know about introduction of agrochemicals, their type and role in agriculture
2. To know in detail about management of agrochemicals for sustainable agriculture.
3. To know about manufacturing and preparation of mixed and complex fertilizers

Theory:

Section – A: 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. 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.

Section – B: 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.

Section – C: 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 potassiumchloride, potassium sulphate and potassium nitrate.

Section – D: 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:

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of

insecticide available kin market. Estimation of nitrogen in Urea. Estimation ofwater soluble P2O5 and citrate soluble P2O5 in single super phosphate. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

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REFERENCES		
Sr. No.	**Books**	**Authors**
1.	Introductory Soil Science	D.K. Das
2.	Fertilizers	R.K. Basak
3.	Pesticides, Insecticides, Fungicides and Herbicides (Agrochemicals) with Formulae, Manufacturing Proces, Machinary & Equipments	Dr. Himadri Panda

Course outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Get knowledge about agro-chemicals and their role in agriculture.
CO2	Get knowledge on agrochemicals viz., fertilizers and pesticides.
CO3	Understand fertilizers, manufacturing processes and their importance.
CO4	Get knowledge on choice of agrochemicals and their impact on the environment.

B.Sc. (Hons.) Agriculture. Semester – IV

WMG-2210 **Weed Management**

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

- Identification, classification, useful and harmful effects of weeds
- Different approaches of weed management.
- To know constraints of weed management in chemical methods and their solutions.
- To understand Integrated weed management system

Theory:

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

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

Section-C: 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.

Section-D: Integration of herbicides with non chemical methods of weed management. Herbicide resistance and its management.

Practical:

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agro-chemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide

application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

Suggested books:-

- Weed Science of Management: Published by- Indian Society of Agronomy
- Weed Management: US Walia (Kalyani Publishers)
- Weed Management: OP Gupta (Published by- Agrobios, India)
- Ecology and Sustainable Development: PS Ramakrishnan (National Book Trust, India)
- Package of Practices for *Rabi* - (Published by- PAU Ludhiana)
- Package of Practices for *Kharif* - (Published by- PAU Ludhiana)

Course outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Get themselves acquainted about why to undertake environmental weed control.
CO2	Learn about different approaches of weed management.
CO3	Study the harmful and beneficial effects of weeds in Agriculture.
CO4	Get themselves acquainted with planning for weed management and weed management processes.

B.Sc. (Hons.) Agriculture. Semester – IV

BPF-2210 Biopesticides & Biofertilizers

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

- To know about history, concept, importance, scope and potential of bio pesticides in agriculture.
- To provide the information about the methods of application of bio pesticides. And methods of quality control and Techniques of bio pesticides.
- To know about the bio fertilizers and its application in the soil.
- To impart the knowledge about bio fertilizers storage, shelf life, quality control land marketing.

Theory:

Section- A: History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses.

Section –B: 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 biopesticide.

Section – C: Biofertilizers – Introduction, status and scope. Structure and characteristic features ofbacterial biofertilizers- *Azospirillum, Azotobacter*, *Bacillus, Pseudomonas, Rhizobium* and *Frankia*; Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, Hapalosiphon and fungal biofertilizers- VAM mycorrhiza and ectomycorrhiza. Nitrogen fixation –Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.

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

Practical:

Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus, Metarhyzium* etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of

entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of *Azospirillum* , *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of VAM fungi –Wet sieving method and sucrose gradient method. Mass production of VAM inoculants.

REFERENCES

Sr. No.	Books	Authors
1.	Introductory Soil Science	D.K. Das
2.	Fundamentals of Soil Science	ISSS, New Delhi
3.	Manures and fertilizer	P.C. Das
4.	Biofertilizers Advances in Bioinoculants	Amitava Rakshit et al.

Course outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Get an overview on the relevance of use of microbial bio pesticides and bio fertilizers.
CO2	Become familiar with vast reserves of microbial biodiversity that provides the opportunity to harness the ability of microorganisms to sustainably minimize damage from pests.

B.Sc. (Hons.) Agriculture. Semester – IV

SSA-2210 **System Simulation and Agro-Advisory**

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100
Theory: 50
Practical: 25
Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

- To understand about system simulation, crop simulation, calibration, validation and verification of modelling.
- To know about basic data set used in crop simulation modelling
- To learn the comparative analysis of crop and weather data with respect to simulation approach
- To familiar about different tools and techniques of weather forecasting.
- Preparation and dissemination of crop weather calendars and agro advisory.

Theory:

Section-A System Approach for representing soil-plant-atmospheric continuem, system boundaries; Crop models, concepts and techniques, types of crop models, data requirements, relational diagrams.

Section-B: Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modelling techniques for their estimation.

Section-C Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity.

Section-D 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:

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

Suggested books:-

- Geoinformatics and Nanotechnology, Precision Agriculture: SR Reddy (Kalyani Publishers)
- Fundamentals of Agrometeorology: GS Mahi and PK Kingra (Kalyani Publishers)

Course outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Learn System Approach for representing soil-plant-atmosphere continuum, system boundaries, Crop models, concepts & techniques.
CO2	Study about types of crop models, data requirements and relational diagrams.

B.Sc. (Hons.) Agriculture. Semester – V

AGR-311 Practical Crop Production-I *(Kharif Crops)*

Time: 3 Hours **Credit hours per week: 2 (0+2)**

Max. Marks: 100

Practical: 75

Internal Assessment: 25

Objectives:

- To gain practical knowledge of raising, harvesting, threshing, processing and storage of different kharif seasons crops.
- To know about efficient use of production inputs.
- To understand economics of raising different crops.

Practical:

Crop planning, raising field crops in multiple cropping systems: 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. 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.

Suggested Books:-

- Weed Management: US Walia (Kalyani Publishers)
- Principles of Agronomy: T Yellamanda Reddy and GH Sankara Reddy (Kalyani Publishers)
- Package of Practices for *kharif* - (Published by- PAU Ludhiana)
- Agronomy of Fodder and Forage Crops: SC Panda (Kalyani Publishers)

Course outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Get acquainted with the knowledge of profitable crop production technology
CO2	Guide farmers about ruminative crop production techniques.
CO3	Adopt a diversified farming system according to available farming situation.
CO4	Encourage the sustainable agriculture system.

B.Sc. (Hons.) Agriculture. Semester – V

PPL-312 Principles of Integrated Pest and Disease Management

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives

The course aims to:

1. To have basic and thorough knowledge about importance and basic concepts of IPM, various principles and methods of detection and diagnosis of pest and diseases.
2. To impart knowledge on ecological management of crop environment, implementation and impact of IPM.

Theory

Section-A: 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.

Section-B: 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.

Section-C: Ecological management of crop environment. 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.

Section-D: Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM.

Practical

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM,Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma, Pseudomona*s, *Trichogramma*, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop

(agroecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases . Awareness campaign at farmers fields.

Suggested Readings-:

1. AgriosGN (2006) Plant Pathology. India: Elsevier India.
2. Abrol DP, ShankarU (eds.) (2012) Integrated Pest Management: Principles and Practice. United Kingdom: CABI.

Course Outcomes:
The student will be able:

Sr. No.	On completing the course, the students will be able to:
CO1	know about different categories of insect pest and diseases
CO2	Study the economic importance of insect, pest, diseases and pest risk analysis.
CO3	Identify different methods of detection and diagnosis of insect, pest and diseases
CO4	Study about different methods of control insect, pest and diseases
CO5	Know safety issues in pesticides use.
CO6	Study the political, social and legal implications of IPM.

B.Sc. (Hons.) Agriculture. Semester – V

SSC-313 Manures, Fertilizers and Soil Fertility Management

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

- We will provide the knowledge about essential nutrients, soil fertility, nutrient transformations in soil.
- To provide the information about manures, fertilizers and soil fertility management through various approaches.
- To know about the fertilizer control order, 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 and factors affecting nutrient availability to plants.
- To provide knowledge on nutrient management concepts and nutrient use efficiencies of major and micronutrients and enhancement techniques.

Theory:

Section-A: 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.

Section-B: Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments,

Section-C: Fertilizer Storage, Fertilizer Control Order. 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.

Section-D: Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. 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.

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Practical

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

REFERENCES		
Sr. No.	**Books**	**Authors**
1.	Manures and fertilizer	P.C. Das
2.	Soil fertility and fertilizers: An Introduction	Tisdale and Nelson
3.	Fundamentals of manures and fertilizer	P.C. Das
4.	Fertilizers	R.K. Basak

Course outcomes:

Sr. No.	**On completing the course, the students will be able to:**
CO1	Get knowledge on essential nutrients, soil fertility, nutrient transformations in soil.
CO2	Understand manures, fertilizers and soil fertility management through various approaches.
CO3	Make decisions on nutrient dose, choice of fertilizers and method of application etc. practiced in crop production.
CO4	Understand various nutrient management concepts and nutrient use efficiencies of major and micronutrients and enhancement techniques.
CO5	Study about soil health - quality indices and their management - Organic farming and Precision Farming - Long term effect of fertilization on soil

B.Sc. (Hons.) Agriculture. Semester – V

ENT-314 Pests of Crops and Stored Grains and Their Management

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives

The course aims to:

1. The farmers' major problem is the insect pests of crops and their control. The students will be taught in such a way that they will be able to identify the insect pest, diagnose the symptom and advocate the necessary remedial measures.
2. This course has significant field relevance along with storage conditions.

Theory

Section-A: General account on nature and type of damage by different arthropods pests.

Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of pests of field crops (Cereals and Millets, pulses, sugarcane, cotton, oilseeds)

Section-B: Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests of vegetable crops and fruit crops

Section-C: Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of pests of plantation crops (Coffee, tea, coconut, rubber, cashewnut), ornamental crops, spices and condiments.

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

Practical

Identification of different types of damage. 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.

Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition.

Suggested Readings:

1. Atwal A S, Dhaliwal G S and David B V (2001) Elements of Economic Entomology. Popular Book Depot, Chennai, India.
2. Dhaliwal G S, Singh R and Chhillar B S (2016) Essentials of Agricultural Entomology. Kalyani Publishers, New Delhi, India. pp. 450.
3. Pedigo L P (1999) Entomology and Pest Management. III Edition. Prentice Hall, New Jersey, USA. pp. 691.
4. Nayar K K, Ananthakrishnan T N and David B V (1976) General and applied Entomology, Tata McGraw Hill Publishing Company Limited, New Delhi, India. pp. 589.

Course Outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Learn to identify different insect pests of field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments, their nature of damage and management practices.
CO2	Know about stored grain pests and factors responsible for losses in stored grains
CO3	Study different storage structures used for grain storage and their effectiveness

B.Sc. (Hons.) Agriculture. Semester – V

PPL-315 Diseases of Field & Horticultural Crops & Their Management-I

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students about symptoms, etiology, disease cycle and management of various diseases.
2. To impart knowledge on various crops affecting major crops and their economic importance.

Theory

Section-A: 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, grain discoloration, foot rot, stem rot, sheath rot and tungro;

Maize: Maydis leaf blight, charcoal rot, gray leaf spot, stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold, downy mildew and anthracnose, **Bajra**: downy mildew and ergot; **Groundnut:** early and late leaf spots, wilt, collar rot and bud necrosis

Section-B: Symptoms, etiology, disease cycle and management of major diseases of following crops:

Field Crops: Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; **Pigeonpea:**Cercospora leaf spot, bacterial leaf spot, Phytophthora blight, wilt and sterility mosaic; **Finger millet**: Blast and leaf spot; **black & greengram:**Ascochyta blight**,** grey mould, wilt, stem rot, foot rot, Cercospora leaf spot and anthracnose, web blight and yellow mosaic; **Castor:**Phytophthora blight; **Cotton:** anthracnose, parawilt, fruit rot, tirak, vascular wilt, and black arm; **Tobacco:** black shank, black root rot and mosaic.

Section-C: Symptoms, etiology, disease cycle and management of major diseases of following crops:

Horticultural Crops:Guava: wilt and anthracnose; **Banana:** Panama wilt, bacterial wilt, Sigatoka and bunchy top; **Papaya:** Anthracnose, foot rot, leaf curl and mosaic, **Pomegranate:** bacterial blight; **Cruciferous vegetables**: Downy mildew, Damping off, Alternaria leaf spot and black rot; **Brinjal:**little leaf, root knot nematode, Phomopsis blight and fruit rot and Sclerotinia blight;

Section-D: Symptoms, etiology, disease cycle and management of major diseases of following crops:

Tomato: root knot nematode, damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; **Okra:** Damping off, 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

Identification and histopathological studies of selected diseases of field and horticulturalcrops covered in theory. Collection and preservation of plant diseased specimens for Herbarium;

Note: Students should submit 50 pressed and well-mounted specimens/ photographs giving systematic position and brief description of symptoms.

Suggested books -:

1. R. P. Singh (2012).Plant Pathology. Kalyani Publishers
2. B.P. Pandey(2001). Plant Pathology. S.Chand Limited Publisher
3. R.S. Singh (2018). Plant Diseases. Oxford and IBH Publisher
4. ThindTS(2005)Diseases of Field Crops and Their Management. India: Daya Publishing House.
5. Singh AK. Srivastava J N (2022) Diseases of Horticultural Crops: Diagnosis and Management: Volume 1: Fruit Crops. United States: Apple Academic Press, Incorporated.
6. Verma LR and SharmaRC(1999) Diseases of Horticultural Crops: Fruits. India: Indus Publishing Company.

Course Outcomes:

The student will be able:

Sr. No.	On completing the course, the students will be able to:
CO1	Identify different disease samples
CO2	Study about symptoms of disease samples of different field and horticultural crops (Khairf crops like Rice, Maize, Bajra, Groundnut, Soyabean)
CO3	Study about etiology of disease samples of different field and horticultural crops (Khairf crops like Rice, Maize, Bajra, Groundnut, Soyabean)
CO4	Study about disease cycle of disease samples of different field and horticultural crops (Khairf crops like Rice, Maize, Bajra, Groundnut, Soyabean)
CO5	Study about management of disease samples of different field and horticultural crops (Khairf crops like Rice, Maize, Bajra, Groundnut, Soyabean)
CO6	Study the collection and preservation of plant diseased kharif specimen for Herbarium

B.Sc. (Hons.) Agriculture. Semester – V

PBG-316 Crop Improvement – I (*Kharif*)

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

5. Question paper should be set strictly according to the syllabus.
6. The language of questions should be straight & simple.
7. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
8. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

- The student will learn about the various plant breeding methods used in different crops
- To Know about the conventional and modern breeding approaches
- To have general principles of seed production in various crops

Theory

Section-A: Centers of origin, distribution of species, wild relatives in different crops namely-

Cereals: Rice, Maize, Sorghum; **Pulses**: Pigeon pea, Urd bean, Mung bean, Cowpea; **Oilseeds:** Soybean, Groundnut, Seasame, Castor.

Section-B: Centers of origin, distribution of species, wild relatives in different crops namely-

Fibre Crops: Jute, Cotton; **Fodder Crops**: Pearl millet, Ragi; **Cash Crops**: Tobacco; **Vegetable and Horticultural Crops:** Brinjal, Okra and Cucurbitaceous crops.

Section-C: Plant genetic resources, its utilization and conservation; Study of genetics of qualitative and quantitative characters; Important concepts of breeding of self-pollinated, cross-pollinated and vegetatively propagated crops; Ideotype concept and climate resilient crop varieties for future.

Section-D: 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); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeon pea, etc.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of

different *kharif* crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed descent methods; Study of field techniques for seed production and hybrid seeds production in *Kharif* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters;

Suggested readings:

1. Crop Breeding: Vol I (Kharif Crops) (Paperback, Dr. Manoj Kumar Sarma)

Course Outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Know about the importance of floral biology.
CO2	Understand emasculation and hybridisation techniques in different kharif crop species like cereals; pulses; oilseeds; forage crops; vegetable and horticultural crops.
CO3	Understand conventional and modern approaches for the development of hybrids and varieties for yield and adaptability.

B.Sc. (Hons.) Agriculture. Semester – V

EXT-317 Entrepreneurship Development and Business Communication

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

It will provide overall picture of planning and development of enterprises for extending sustainable livelihood for rural people. It will Generate awareness about various government institutes and scheme related to entrepreneurship development and impart knowledge of different stakeholders involved in the entreneurship development and different methods of business communication.

Theory

Section-A: Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation,

Section-B: Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agri-enterprises,

Section-C: Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill,

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

Practical

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing,

Suggested Readings

1. Chole RR. *et al.*Entrepreneurship development and communication skills. Scientific publishers, New Delhi.
2. Indu Grover. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy.
3. Khanka SS. 1999. Entrepreneurial Development. S. Chand & Co.
4. Tripathi PC & Reddy PN. 1991. Principles of Management. Tata McGraw Hill.
5. Viramgami, H.S. 2007 Fundamentals of Entrepreneurship (Entrepreneur and Entrepreneurship) A.P.H. publishing corporation, Darya Ganj, New Delhi.

Course outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Get knowledge about setting up various enterprises.
CO2	Get acquainted with importance of planning and monitoring of enterprises
CO3	Get knowledge about various government institutes and scheme related to entrepreneurship development
CO4	Get knowledge about business communication methods

B.Sc. (Hons.) Agriculture. Semester – V

AGR-318 Geoinformatics, Nano-Technology and Precision Farming

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

- To familiarise the students with the role of GPS, GIS and Remote sensing in Precision Agriculture
- To familiarise the students with the concept of Crop Modelling

Theory

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

Section-B: Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geo-spatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions;

Section-C: Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture;

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

Practical

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

Suggested books:-

- Geoinformatics and Nanotechnology, Precision Agriculture: SR Reddy (Kalyani Publishers)

Course Outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Study the concept of "doing the right thing in the right place at the right time" having a strong intuitive appeal which gives farmers the ability to use all operations and crop inputs more effectively.
CO2	Use inputs which result in greater crop yield and/or quality, without polluting the environment.
CO3	Understand precision agriculture which addresses both economic and environmental issues that surround production agriculture these days.
CO4	Encourage the farmers to study spatial and temporal variability of the input parameters using primary data at field level.

B.Sc. (Hons.) Agriculture. Semester – V

FST-319 Principles of Food Science and Nutrition

Time: 3 Hours **Credit hours per week: 2 (2+0)**
Max. Marks: 100
Theory: 75
Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 marks each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course objectives

- To understand the basic principles of food science and food preservation
- To impart fundamental knowledge about food chemistry and food microbiology.
- To Gain knowledge of the role of nutrition in sustaining health and preventing diseases
- To gain insights about the role of various nutrients in maintaining health and identifying nutrient specific foods.

Theory

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

Section-B: Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions);

Section-C: 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.);

Section-D: 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.

Suggested Readings

1. Sehgal, S. and Raghuvanshi, R.S. (2007) Text Book of Community Nutrition. ICAR, New Delhi.
2. Owen R, Fennema. 1996. Food Chemistry, 3rd Ed. Marcel Dekker, Inc., New York, USA.

3. Fellows P. 2000. Food Processing Technology: Principles and Practice, 2nd Ed. CRC Press, Boca Raton, FL, USA.
4. Norman N Potter. 1998. Food Science, 5rd Ed Springer Science Business media, New York

Course Outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Understand food composition and chemistry.
CO2	Know the role of microbiology in food industry.
CO3	Get knowledge about balanced nutrition and new trends in food science and nutrition.

5. .

B.Sc. (Hons.) Agriculture. Semester – V

PCV-3110 **Protected Cultivation**

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives :

The main objective of this course is the better understanding of recent advances in crop management under protected cultivation ; Obtaining sufficiency in fruits, vegetables and flowers under protected cultivation in on and off season ; Better designing of infrastructure for protected cultivation in different agro-climatic conditions ; Enhancement of total crop duration of horticultural crops than traditional ones ; Developing low cost indigenous protected cultivation technologies for enhancing productivity in horticultural crops.

Theory:

Section-A: Protected cultivation- importance and scope, Status of protected cultivation in India andWorld types of protected structure based on site and climate. Cladding material involved ingreenhouse/ poly house.

Section-B: Greenhouse design, environment control, artificial lights, Automation.Soil preparation and management, Substrate management. Types of benches and containers.Irrigation and fertigation management.

Section-C: Propagation and production of quality planting materialof horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation,chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber,strawberry, pot plants, etc.

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

Practical:

Raising of seedlings and saplings under protected conditions, use of portrays in qualityplanting material production, Bed preparation and planting of crop for production, Inter culturaloperations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip,fogging ad misting.

Suggested Readings :

1. D.K. Singh, K.V. Peter (2014)*Protected Cultivation of Horticultural Crops***.**New India Publishing Agency.
2. Madan Kumar Jha, Sujan Singh Piarka, Manju Rani Sahu (2019) *Protected Cultivation of Horticulture Crops.* Educreation Publishing.
3. Balraj Singh (2020). *Protected cultivation of vegetables*. Kalyani Publishers.
4. M.T. Patil , P.V. Patil (2004). *Commercial Protected Floriculture*. Oxford Book Company.
5. Aldrich RA & Bartok JW. (1994). *Green House Engineering*. NRAES, Riley, Robb Hall, Cornell University, Ithaca, New York.
6. Bhatcharjee BS. (1959). *Rose Growing in Tropics*.
7. Thackarspink & Co. Laurie A, Kiplingr DD & Nelson KS.(1968.)*Commercial Flower Forcing.* McGraw-Hill.
8. Mears DR, Kim MK & Roberts WJ. (1971). *Structural Analysis at an Experimental Cable-supported Air Inflated Green Houses*. Trans. ASAE.
9. Pant V Nelson.(1991). *Green House Operation and Management*. Bali Publ.
10. Pradeep kumar T, Suma B, Jyothibhaskar & Satheesan KN. (2007.) Management of Horticultural Crops. Parts I, II. New India Publ. Agency.

Course outcomes :

After the course completion the students will be able to :

Sr. No.	On completing the course, the students will be able to:
CO1	Get knowledge about greenhouse technology, types of greenhouses and construction of greenhouses and various other protected structures.
CO2	Gain the knowledge of greenhouse equipments, materials of construction for traditional and low cost green houses
CO3	Learn about Irrigation systems used in greenhouses, shade net house in protected cultivation
CO4	Learn the concepts of cleaning and grading moisture measurement.
CO5	Understand the material handling equipment, principle and working.

B.Sc. (Hons.) Agriculture. Semester – V

MPT-3110 Micro Propagation Technique

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives :

To acquaint students with the principles, technical requirement, scientific and commercial applications of plant tissue and cell culture ; To expose the students to supporting methodologies of plant tissue and cell culture, micropropagation techniques and applications of tissue and cell culture to plant improvement.

Theory:

Section-A: Introduction, History, Advantages and limitations;

Section-B: Types of cultures (seed, embryo, organ,callus, cell), Stages of micropropagation,

Section-C: Axillary bud proliferation (Shoot tip and meristemculture, bud culture),Organogenesis (callus and direct organ formation), Somatic embryogenesis,cell suspension cultures,

Section-D: Production of secondary metabolites, Somaclonal variation,Cryopreservation

Practical:

Identification and use of equipments in tissue culture Laboratory, Nutrition media composition,sterilization techniques for media, containers and small instruments, sterilization techniques forexplants, Preparation of stocks and working solution, Preparation of working medium, Culturingof explants: Seeds, shoot tip and single node, Callus induction, Induction of somatic embryosregeneration of whole plants from different explants, Hardening procedures.

Suggested Readings:

1. Hudson T Hartmann, Dale E.Kester, Fred. T. Daves, Robert L. Geneve (2015). *Plant Propagation: Principles and Practices* .Pearson Education India.
2. Roberta H. Smith (2013). *Plant Tissue Culture*. Academic Press.
3. Indra K Vasil, Trevor A Thorne (1994). *Plant cell and Tissue Culture*

Course outcomes :

Sr. No.	On completing the course, the students will be able to:
CO1	Learn how to produce a large number of plantlets from a small explant.
CO2	Get knowledge about the production of microbe free plantlets; how to save the endangered plants species by regenerating plantlets from small explants.
CO3	Generate a new variety of agriculturally important crops with a shorter time span and space than the conventional breeding method.

B.Sc. (Hons.) Agriculture. Semester – V

LSP-3110 **Landscaping**

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives :

This course will provide a number of tips and techniques to develop an ideal landscape ; Design principles and implementation of ideas in one's own unique setting ; Material application, cost estimation, visual analysis, planting design, irrigation, water features, design for outdoor living, and business concepts for landscaping professionals.

Theory:

Section-A: 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.

Section-B: Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceousperennials: selection, propagation, planting schemes, architecture. Climber and creepers:importance, selection, propagation, planting,

Section-C: Annuals: selection, propagation, planting scheme,Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement,management.

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

Practical:

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals,care and maintenance of plants, potting and repotting, identification of tools and implements usedin landscape design, training and pruning of plants for special effects, lawn establishment andmaintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden,terrace garden, rock garden) and designing of conservatory and lathe house. Use of computersoftware, visit to important gardens/ parks/ institutes.

Suggested Readings :

1. J.S Arora(2021). *Introductory Ornamental Horticulture*. Kalyani Publishers.

2. *Introduction to Landscaping: Design, Construction and Maintenance* – Prentice Hall / Interstate.

3. Anjana Sisodia, Anil K Singh (2017). *Textbook of Floriculture And Landscaping .* New India Publishing Agency.

4. *Packages and Practices of Floriculture and Landscaping*. PAU Ludhiana.

Course outcomes :

Sr. No.	On completing the course, the students will be able to:
CO1	Become familiarize with the annuals, flowers, trees, shrubs, principles and practices of landscaping and ornamental plants
CO2	Get knowledge about the landscape designs, its principles and practices of garden features and structures and how to save the endangered plants species by regenerating plantlets from small explants.
CO3	Identify types of gardens, their styles in view of English, Mughal, Japenese and other popular gardens of India.
CO4	Learn the skill of propagation of trees, shrubs and ornamental plants.
CO5	Prepare layout of landscaping of schools, public places and government institutions.

B.Sc. (Hons.) Agriculture. Semester – V

HTH-3110 **Hi-Tech. Horticulture**

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives :

The aim of this study is to enhance productivity in agriculture; Prevention of soil degradation in cultivable land ; Reduction of chemical use in crop production ; Efficient use of water resources ; Dissemination of modern farm practices to improve quality, quantity and reduced cost of production in agricultural crops

Theory:

Section-A: Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods,

Section-B: Protected cultivation: advantages, controlled conditions, method and techniques,
Section-C: Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding,
Section-D: 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: Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

Suggested Readings :

1. Jitendra Singh , S.K.Jain, L.K. Dashara and B.S. Chundawat (2013). Precision Farming in Horticulture . New India Publishng Agency.
2. Balraj Singh (2020). Protected cultivation of vegetables. Kalyani Publishers.
3. T.A.More, MPKV,Rahuri Balraj Singh (2005) . Hi-tech Horticulture : Protected cultivation of vegetable crops. Kalyani publication
4. M.T. Patil , P.V. Patil (2004). Commercial Protected Floriculture. Oxford Book Company.
5. MPKV,Rahuri Commercial floriculture- Kalyani Publshers.
6. Paul V. Nelson (1978). Green house operation & Management: Reston Publishing.

Course outcomes :

After completing the course :

Sr. No.	**On completing the course, the students will be able to:**
CO1	Get detailed knowledge on modern advanced technologies and their application in horticulture like micro propagation, precision farming and high density orchard mechanization and management.
CO2	Get knowledge on remote sensing, geographical information system, differential geo positioning system, variable rate applicator.
CO3	Get themselves acquainted with the application of precision farming in horticultural crops

B.Sc. (Hons.) Agriculture. Semester – VI

AGR-321 Practical Crop Production-II *(Rabi Crops)*

Time: 3 Hours **Credit hoursper week: 2 (0+2)**
Max. Marks: 100
Practical: 75
Internal Assessment: 25

Course objectives;

- Physical experience to students about various cultural operations at farm
- Efficient and sustainable resource use in agriculture
- Farm budgeting experience

Practical

Crop planning, raising field crops in multiple cropping systems: 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. 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.

Suggested Books:-

- Weed Management: US Walia (Kalyani Publishers)
- Principles of Agronomy: T Yellamanda Reddy and GH Sankara Reddy (Kalyani Publishers)
- Package of Practices for *Rabi crops* - (Published by- PAU Ludhiana)
- Agronomy of Fodder and Forage Crops: SC Panda (Kalyani Publishers)

Course Outcomes:-

Sr. No.	**On completing the course, the students will be able to:**
CO1	Get acquainted with the knowledge of profitable crop production technology
CO2	Guide farmers about ruminative crop production techniques.
CO3	Adopt a diversified farming system according to available farming situations.
CO4	Encourge the sustainable agriculture system.

B.Sc. (Hons.) Agriculture. Semester – VI

AGR-322 Rainfed Agriculture and Watershed Management

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives;

- Efficient and sustainable resource use in agriculture
- Knowledge of various water conservation and its efficient use in rainfed farming
- Understanding climate pattern of country and selection of crops as per climate changes

Theory:

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

Section-B: 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;

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

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

Practical:

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

B.Sc. (Hons.) Agriculture. Semester – VI

Suggested Books:-

- Principles of Agronomy: T Yellamanda Reddy and GH Sankara Reddy (Kalyani Publishers)
- Dryland Agriculture, Reddy and Reddy (Kalyani Publishers)
- Rainfed Agriculture and watershed management by SR Reddy

Course Outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO 1	Learn about the various techniques of crop raising in rainfed conditions.
CO 2	Learn about the various water conservation techniques in rainfed farming.
CO 3	Learn how the rainfall water can be used for a larger area by suitable watershed management techniques

B.Sc. (Hons.) Agriculture. Semester – VI

AEN-323 Protected Cultivation and Secondary Agriculture

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives: The aim of this course is to acquaint the students with the various protected cultivation structures being used for the cultivation and to understand the design parameters of these structures. To also familiarize the students with post-harvest management of the crops and also with equipments/machines used for handling of the harvested crops.

Theory:

Section-A: Green house technology: Introduction, Types of Green Houses; Plant response to Green houseenvironment, 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.

Section-B: Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

Section-C: Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.

Section-D: 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

Study of different type of green houses based on shape. Determine the rate of air exchange inan active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

Suggested Readings

· Green House Technology & Management by K.RadhaManohar (2000) C.Igathinathane B.S. Publications.

· Unit Operations of Agricultural Processing by K.M. Sahay and K.K.Singh (2009) Vikas Publishing House Pvt. Ltd.

· Post harvest Technology of Cereals, Pulses and Oilseeds by A. Chakraverty (1997)Oxford & IBH Publishing Co. Pvt. Ltd.

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO 1	Understand the greenhouse technology
CO 2	Design greenhouse cooling and heating systems
CO 3	Do cost estimation and economic analysis of protected cultivation structures
CO 4	Understand the working of different conveying and drying systems used in the food industry

B.Sc. (Hons.) Agriculture. Semester – VI

PPL-324 Diseases of Field & Horticultural Crops & their Management-II

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students about symptoms, etiology, disease cycle and management of various diseases.
2. To impart knowledge on various crops affecting major crops and their economic importance.

Theory:

Section-A: Symptoms, etiology, disease cycle and management of following diseases:

Field Crops: **Wheat:** rusts, loose smut, flag smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; **Sugarcane:** red rot, red stripe, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; **Sunflower**: Sclerotinia stem rot and Alternaria blight;

Section-B: Symptoms, etiology, disease cycle and management of following diseases:

Field Crops: **Mustard:** Alternaria blight, phyllody, white rust, downy mildew and Sclerotinia stem rot; **Gram:** wilt, stem rot, foot rot, grey mould and Ascochyta blight; **Lentil:** blight, rust and wilt; **Pea:** downy mildew, wilt, root rot and collar rot, white rot, powdery mildew and rust.

Section-C: Symptoms, etiology, disease cycle and management of following diseases:

Horticultural Crops: Mango: anthracnose, black tip, malformation, bacterial blight and powdery mildew; **Citrus:** canker, gummosis, scab, anthracnose, sooty mould, citrus greening, tristeza, exocortis and ring spot; **Grape vine:** downy mildew, cercospora leaf spot, powdery mildew and anthracnose; **Apple:** scab, powdery mildew, fire blight and crown gall; **Peach:** leaf curl, **Strawberry:** leaf spot

Section-D: Symptoms, etiology, disease cycle and management of following diseases:

Horticultural Crops: Potato: early and late blight, common scab, black scurf, leaf roll, and mosaic; **Cucurbits:** downy mildew, powdery mildew, wilt; **Onion** and **garlic:** purple blotch, downy mildew and Stemphylium blight; **Chillies:** wet rot, mosaic, 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

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Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems.

Note: Collection and preservation of plant diseased specimens for herbarium/photographs with systematic position and brief description of symptoms.

Suggested books -:

R. P. Singh (2012).Plant Pathology. Kalyani Publishers

B.P. Pandey(2001). Plant Pathology. S.Chand Limited Publisher

R.S. Singh (2018). Plant Diseases. Oxford and IBH Publisher

ThindTS(2005)Diseases of Field Crops and Their Management. India: Daya Publishing House.

Singh AK., Srivastava J N (2022) Diseases of Horticultural Crops: Diagnosis and Management: Volume 1: Fruit Crops. United States: Apple Academic Press, Incorporated.

Verma LR and SharmaRC(1999) Diseases of Horticultural Crops: Fruits. India: Indus Publishing Company.

Course Outcomes:
The student will be able:

Sr. No.	On completing the course, the students will be able to:
CO1	Identify different disease samples
CO2	Study about symptoms of disease samples of different field and horticultural crops (Rabi crops like Wheat, Barley, Mustard, sesame, peas, bean, brinjal, broccoli, chickpea, sweet potato, turnip)
CO3	Study about etiology of disease samples of different field and horticultural crops (Rabi crops like Wheat, Barley, Mustard, sesame, peas, bean, brinjal, broccoli, chickpea, sweet potato, turnip)
CO4	Study about disease cycle of disease samples of different field and horticultural crops (Rabi crops like Wheat, Barley, Mustard, sesame, peas, bean, brinjal, broccoli, chickpea, sweet potato, turnip)
CO5	Study about management of disease samples of different field and horticultural crops (Rabi crops like Wheat, Barley, Mustard, sesame, peas, bean, brinjal, broccoli, chickpea, sweet potato, turnip)
CO6	Understand about the collection and preservation of plant diseased Rabi specimen for Herbarium

B.Sc. (Hons.) Agriculture. Semester – VI

FSC-325 Post Harvest Management and Value Addition of Fruits and Vegetables

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

The main aim of the course is to provide basic knowledge of postharvest processing methods and processes involved in post harvest loss reduction ; To introduce postharvest management practices which are eco-friendly and sustainable by integrating them with existing modern technologies; To encourage students in product development, conversion of fresh produce to processed form for value addition (nutritive and economic value).

Theory:

Section-A: 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;

Section-B: Respiration and factors affecting respiration rate; Harvesting and field handling;

Section-C: Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation;

Section-D: Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Drying/ Dehydration of fruits and vegetables –packaging of products.

Practical

Applications of different types of packaging, containers for shelf life extension. Effect of temperature on shelf life and quality of produce. Demonstration of chilling and freezing injury in vegetables and fruits. Extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, tomato products. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/ industry.

Suggested readings:

1.Chadha KL and Pal RK. 2015. Managing postharvest quality and losses in horticultural crops. Vol-1: General Issues, 1-231p Astral International (P) Ltd., New Delhi

2.Chadha KL and Pal RK. 2015. Managing postharvest quality and losses in horticultural crops. Vol-2: Fruit Crops, 253-561p Astral International (P) Ltd., New Delhi

3.Chadha KL and Pal RK. (2015) Managing postharvest quality and losses in horticultural crops. Vol-3: Vegetables, Flowers and Plantation Crops, 581-727p Astral International (P) Ltd., New Delhi.

4.Hodges DM. 2003. Postharvest Oxidative Stress in Horticultural Crops, 1st Edition, ISBN 9781560229636

5.Paliyath G, Murr DP, Handa AK and Lurie S. 2008. Postharvest Biology and Technology of Fruits, Vegetables and Flowers, Wiley-Blackwell, ISBN: 9780813804088.

6.Sunil Pareek (Ed.) 2016. Postharvest Ripening Physiology of Crops,CRC Press, ISBN 9781498703802.

7.Thompson AK. 1995. Post harvest Technology of fruits and vegetables. Blackwell Sciences

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Understand the post-harvest technology of horticultural crops.
CO2	Know the value addition of horticulture crops.
CO3	Have knowledge on the work space, tool and equipment design for PHT and value addition.
CO4	Get acquainted with the various certification and accreditation i.e. FPO, ISO and other leveling

B.Sc. (Hons.) Agriculture. Semester – VI

ENT-326 Management of Beneficial Insects

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students on rearing of honey bees, silkworms and lac insects
2. To impart knowledge to the students about the commercial importance of honey bees, silkworms and lac insects.

Theory

Section-A: 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.

Section-B: 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.

Section-C: 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.

Section-D: Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Role of pollinators in cross pollinated plants. Important species of pollinator, weed killers and scavengers with their importance.

Practical

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of

harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

Suggested readings:

1. Dhaliwal G.S., Singh R. and Chhillar B.S. (2016) Essentials of Agricultural Entomology. Kalyani Publishers, New Delhi, India. pp. 450.
2. Koshariya A.K., Jadhav S.M., Ashok N.A. (2021) Management of Beneficial Insect. Iterative International Publisher IIP.
3. Gurjar M.K., Nayak R.K., Choudhary J.S., Yadav B. (2023) Recent Trends in Management of Agricultural Pests Including Beneficial Insects. AkiNik Publications

Course Outcomes:

Sr. No.	On completing the course, the students will be able to:
CO1	Know about the importance of beneficial insects, their rearing and various problems associated with them and their management.
CO2	Establish small scale venture based on these beneficial insects and contribute to the overall development of the society

B.Sc. (Hons.) Agriculture. Semester – VI

PBG-327 Crop Improvement – II (*Rabi*)

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

- The student will learn about the various plant breeding methods used in different rabi crops
- To Know about the conventional and modern breeding methods in cross and self pollinated crops
- To have general principles of hybrid seed production in various crops

Theory

Section-A: Centers of origin, distribution of species, wild relatives in different crops namely,

Cereals: Wheat, Oat, Barley; **Pulses**: Chickpea, Lentil, Field pea, Rajma, Horse gram; **Fodder Crops**:Berseem;

Section-B: Centers of origin, distribution of species, wild relatives in different crops namely,

Oilseeds: Rapeseed, Mustard, Sunflower, Safflower; **Cash Crops**: Potato, Sugarcane; **Vegetable and Horticultural Crops**: Tomato, Chilli, Onion;

Section-C: Plant genetic resources, its utilization and conservation; Study of genetics of qualitative and quantitative characters; Important concepts of breeding of self-pollinated, cross-pollinated and vegetatively propagated crops; Ideotype concept and climate resilient crop varieties for future.

Section-D: 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); Hybrid seed production technology in *rabi* crops.

Practical

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; Handling of

germplasm and segregating populations by different methods like pedigree, bulk and single seed descent methods; Study of field techniques for seed production and hybrid seeds production in *Rabi* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters;

Suggested readings:

1. Crop improvement-II (rabi crops) practical manual Paperback – Import, 5 March 2020 by Amit Tomar (Author)

Course Outcomes:-

Sr. No.	**On completing the course, the students will be able to:**
CO1	Know about the importance of floral biology, emasculation and hybridisation techniques in different rabi crop species like cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops.
CO2	Learn the major breeding objectives and procedures including conventional and modern approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical and nutritional).
CO3	Be well equipped with the practices and techniques of handling of Germplasm and segregating populations and also the role of ldeotype concept and climate resilient rabi crop varieties for future.

B.Sc. (Hons.) Agriculture. Semester – VI

AGR-328 Principles of Organic Farming

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives;

- Understand the concept, potential and scope of organic farming at local national and at global levels
- To familiarize with cultural practices of organic farming
- Procedure of certification and marketing of organic products

Theory:

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

Section-B: 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;

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

Section-D: Certification process and standards of organic farming; processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical:

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

Suggested Reading:

1. Ananthakrishnan TN. (Ed.). 1992. Emerging Trends in Biological Control of Phytophagous Insects. Oxford & IBH.
2. Gaur AC. 1982. A Manual of Rural Composting, FAO/UNDP Regional Project Document, FAO.
3. Joshi M. 2016. New Vistas of Organic Farming. Scientific Publishers
4. Lampin N. 1990. Organic Farming. Press Books, lpswitch, UK.
5. Palaniappan SP and Anandurai K. 1999. Organic Farming – Theory and Practice. Scientific Publ.
6. Rao BV Venkata. 1995. Small Farmer Focused Integrated Rural Development: Socio-economic Environment and Legal Perspective: Publ.3, Parisaraprajna Parishtana, Bangalore.
7. Reddy MV. (Ed.). 1995. Soil Organisms and Litter Decomposition in the Tropics. Oxford & IBH.
8. Sharma A. 2002. Hand Book of Organic Farming. Agrobios.
9. Singh SP. (Ed.). 1994. Technology for Production of Natural Enemies. PDBC, Bangalore.
10. Subba Rao NS. 2002. Soil Microbiology. Oxford & IBH.
11. Trivedi RN. 1993. A Text Book of Environmental Sciences, Anmol Publ.
12. Veeresh GK, Shivashankar K and Suiglachar MA. 1997. Organic Farming and Sustainable Agriculture. Association for Promotion of Organic Farming, Bangalore.
13. WHO. 1990. Public Health Impact of Pesticides Used in Agriculture. WHO.
14. Woolmer PL and Swift MJ. 1994. The Biological Management of Tropical Soil Fertility. TSBF & Wiley

Course Outcomes:-

Sr. no	On completing the course, the students will be able to:
CO1	Study about the initiative from Government for organic produce.
CO2	Study the role of NGOs in producing organic products.
CO3	Select crops and varieties for organic produce
CO4	Get knowledge about the Certification of organic produce.

B.Sc. (Hons.) Agriculture. Semester – VI

AGE-329 Farm Management, Production and Resource Economics

Time: 3 Hours **Credit hours per week: 2 (1+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objective:-

This course makes students aware to measure management performance and financial condition of farm business; develop decision making skills in planning, organizing, directing and controlling farm business.

Theory:

Section-A: 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. 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 productproduct relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage.

Section-B: 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.

Section-C: 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.

Section-D: 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. Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical

Preparation of farm layout. Determination of cost of fencing of a farm. Computation of

depreciation cost of farm assets. 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. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts.

Suggested readings:-

1. Fundamentals of farm business management by S.S.Johl and T.R.Kapoor
2. Economics of farm production and management by V.T.Raju and D.V.S Rao

Course Outcomes:-

Sr. no	**On completing the course, the students will be able to:**
CO1	Study the meaning and scope of farm management, objectives, principles and applications.
CO2	Get knowledge about types & systems of farming, planning & budgeting techniques.
CO3	Study the risks and uncertainty sources ,their types and management.

B.Sc. (Hons.) Agriculture. Semester – VI

IPR-3210 Intellectual Property Rights

Time: 3 Hours **Credit hours per week: 1 (1+0)**

Max. Marks: 100

Theory: 75

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 15 marks (comprising of 10 short answer type questions of 1.5 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (15).

Course Objectives-

To make student aware about the role, importance and significance of intellectual property. To learn the procedure of obtaining patents, copyrights, trademarks and industrial design. To make the students to understand statutory provisions of different forms of IPRs in simple form.

Theory:

Section-A: 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.

Section-B: 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, filingof patent, patent specification, patent claims, Patent opposition and revocation, infringement,Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Section-C: 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.Traditional knowledge-meaning and rights of TK holders.

Section-D: Convention on Biological Diversity, International treaty on plant genetic resources for foodand agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, accessand benefit sharing.

Suggested Books:

1. Erbisch FH and Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Ganguli P. 2001. Intellectual Property Rights: Unleashing Konwledge Economy. McGraw-Hill.
3. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC and Aesthetic Techonologies.

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Course Outcomes:-

Sr. no	On completing the course, the students will be able to:
CO1	Study brief introduction to GATT, WTO, history, legislations of IPR in India
CO2	Study the copyrights, patents, trademarks and geographical indication
CO3	Get knowledge about Indian Biological Diversity Act 2012: Features, access and benefit sharing.

B.Sc. (Hons.) Agriculture. Semester – VI

ABM-3211 Agri-Business Management

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

1. To learn about the Agricultural stakeholders in the Agri-Business supply chain Management.

Theory:

Section-A: Transformation of agriculture into agribusiness, various stakeholders and components ofagribusiness systems. Importance of agribusiness in the Indian economy and New AgriculturalPolicy. Distinctive features of Agribusiness Management: Importance and needs of agro-basedindustries, Classification of industries and types of agro based industries.

Section-B: Institutional arrangement,procedures to set up agro based industries. Constraints in establishing agro-based industries.Agri-value chain: Understanding primary and support activities and their linkages. Businessenvironment: PEST & SWOT analysis. Management functions: Roles & activities, Organizationculture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives,Strategies, polices procedures, rules, programs and budget.

Section-C: Components of a business plan, Stepsin planning and implementation. Organization staffing, directing and motivation. Ordering,leading, supervision, communications, control. Capital Management and Financial management ofAgribusiness. Financial statements and their importance.

Section-D: Marketing Management: Segmentation,targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis,Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricingmethods. Project Management definition, project cycle, identification, formulation, appraisal,implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical:

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits,vegetables, flowers. Study of product markets, retails trade commodity trading, and value addedproducts. Study of financing institutions- Cooperative, Commercial banks, RRBs, AgribusinessFinance Limited, NABARD. Preparations of projects and Feasibility reports for agribusinessentrepreneur. Appraisal/evaluation techniques of identifying viable project- Non-

discountingtechniques. Case study of agro-based industries. Trend and growth rate of prices of agriculturalcommodities. Net present worth technique for selection of viable project. Internal rate of return.

Suggested Books:

1. Barnard, F. L., Foltz, J., Yeager, E. A., & Brewer, B. (2020). *Agribusiness management*. Routledge.
2. Van Fleet, D., Van Fleet, E., & Seperich, G. J. (2013). *Agribusiness: Principles of management*. Cengage Learning.

Course Outcomes:-

Sr. no	On completing the course, the students will be able to:
CO1	Get knowledge about transformation of agiculture and agribusiness, components, stakeholders and importance of agribusiness in India
CO2	Understand marketing management, segmentation, marketing strategies, pricing policies and sales & distribution management.

B.Sc. (Hons.) Agriculture. Semester – VI

CPB-3211 Commercial Plant Breeding

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

1. To acquaint about the advances and development in hybrid seed production,
2. To have knowledge about the Intellectual property rights,
3. Knowledge about DUS characterization of different crops.

Theory:

Section-A: 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.

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

Section-C: 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.

Section-D: 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:

Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea,

cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. Visit to public private seed production and processing plants.

Suggested Readings:

1. Commercial Plant Breeding by Singh Phundan & Pratibha Bisen

Course Outcomes:-

Sr. No.	On completing the course, the students will be able to:
CO1	Get basic knowledge on various principles and practices of plant breeding, hybrid seed production techniques (two and three line method),
CO2	Study the advancement in hybrid seed production of various crops, release of varieties and IPR.

B.Sc. (Hons.) Agriculture. Semester – VI

FSS-3211 Food Safety and Standards

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course objectives:

- To understand the importance of food safety, hygiene and sanitation along with various factors affecting them.
- To create awareness about food safety management tools, various laws and standards related to food.
- To understand the general requirements for packaging and labeling of various food products.

Theory:

Section-A: Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards andRisks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need.Control of parameters. Temperature control. Food storage. Product design. **Section-B:** Hygiene and Sanitation In Food Service Establishments- Introduction. Sources of contamination and their control. WasteDisposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.

Section-C: Food SafetyManagement Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM- concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation andAuditing, Water Analysis, Surface Sanitation and Personal Hygiene. 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.

Section-D: Packaging, Product labeling andNutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical:

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

Suggested Readings

1. Gorham, R.J. (1994) Hard foreign objects in food as a cause of injury and disease: a review. In Foodborne Disease Handbook, Vol. 3. Marcel-Dekker.
2. Food Safety: A Guide to What You Really Need to Know, J M Hemminger; published in 2000 by Wiley-Blackwell
3. Principles of Food Sanitation (Food Science Text Series), 5th Edition 2006, N Marriott & R B Gravanni, published by Springer
4. Applied Food Service Sanitation, National Restaurant Association, Wiley, John & Sons.
5. Schmidt, R. H. and Rodrick, G. E. (2003). Food Safety Handbook: John Wiley, New Jersey.
6. Rees, N. and Watson, D. (2000). International Standards for Food Safety: Aspen, America.

Course Outcomes:-

Sr. no	On completing the course, the students will be able to:
CO1	Learn about food safety, types of hazards, control of parameters and waste disposal.
CO2	Learn about food safety management tools.

B.Sc. (Hons.) Agriculture. Semester – VI

ACJ-3211 Agricultural Journalism

Time: 3 Hours **Credit hours per week: 3 (2+1)**

Max. Marks: 100

Theory: 50

Practical: 25

Internal Assessment: 25

Instructions for the paper setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of nine questions, out of which first question of 10 marks (comprising of 10 short answer type questions of 1 mark each) covering the whole syllabus will be compulsory.
4. Of the remaining 8 questions, two questions will be asked from each section (A,B,C,D) and the candidate will attempt 4 questions (one from each section). All questions will carry equal marks (10).

Course Objectives:

1. Learn about Agricultural Journalism, types of journalism and agriculture story.

Theory

Section-A: 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.

Section-B: 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.

Section-C: 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.

Section-D: 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

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title

writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.

Suggested Readings:

1. Agricultural Journalism by B. L. Jana.
2. Agricultural Journalism by Satwik Sahay Bisarya, Rahul Ojha, Ritwik Sahay Bisarya.

Course Outcome:-

Sr. no	On completing the course, the students will be able to:
CO1	Learn about Agricultural Journalism, types of journalism and agriculture story.
CO2	Study about sources of agriculture information, interviews and editorial mechanics.

B.Sc. (Hons.) Agriculture. Semester – VII & VIII

The students can opt for any of the two groups (A & B) in Semester-VII. In Sem-VIII the students will opt for group other than that opted in Sem-VII.

Group-A

Rural Agricultural Work Experience and Agro-Industrial Attachment (RAWE & AIA)

Course objectives of RAWE-411:

The Course provides:

1. exposure to agriculture students with ground level situation of rural socio economics dynamics.
2. orientation and familiarization on various issues and problems expected on farmers field.
3. competance and confidence for solving problems related to various agriculture interventions.

RAWE-411:

- **General Orientation and Village Attachment Training Programmes: (1+8 weeks):**

Appropriate number of villages will be selected and group of students will be allotted a village. Approximately 25 students will be allotted one village and two teachers will assist them in the selected village. Students will study the following interventions in the respective villages allotted to them.

1. Orientation & Survey of the village to study the social-economic profile. – 1 week
2. Agronomic intervention - 1 week
3. Plant Protection Intervention - 1 week
4. Soil Improvement - 1 week
5. Fruit & Vegetable Production Intervention - 1 week
6. Food Processing and storage intervention - 1 week
7. Extension & Transfer of Technology - 1 week
8. Animal Production Intervention - 1 week

For each intervention, concerned specialized teacher would be assigned the duty so as to ensure comprehensive study of the area. The students will record their observation based on daily field observation recorded in note books and weekly diaries maintained by them to prepare the final report based on these observations.

The timings of the village attachment will be flexible so as to coincide with the main cropping season.

Course Outcomes:

1. The students get understanding of rural situations, status of agricultural technologies adopted by farmers.
2. Develop skills and attitudes of working with farm families for overall development in rural areas.

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RAWE-412: Plant clinic (3 weeks) Plant clinic established in the farm/department & subject experts will be asked to coordinate the training.

Course Objectives: (AIA-413, AIA-414)

1. To expose the students to industrial environment, which cannot be simulated in the classes.
2. To familiarize the students with various Materials, Machines, Processes, Products and their applications along with relevant aspects of shop management.
3. To make the students understand the scope, functions and job responsibilities in various departments of an organization.
4. To provide exposure on various aspects of entrepreneurship during the program period.

AIA-413: Agro-Industrial Attachment-I (4 weeks)

AIA-414: Agro-Industrial Attachment-II (4 weeks)

Agro-Industrial Attachment (8 weeks): The students would be attached with two varied Agro-Industries, one at a time for a period of six weeks (4+4) to get an experience of the industrial environment and working.

Students shall be placed in Agro and cottage industries (List attached*)

Activities during agro industrial attachment programmes.

- 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 the 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.

Course Outcomes:

The students after getting training of AIA-413 & AIA-414 could get:

1. first-hand information of structure, mandate, functioning and working of the Agro-Industrial/Institutions/organizations.
2. skill in Business networking to help initiate or set up a START UP.

B.Sc. (Hons.) Agriculture. Semester – VII & VIII

Evaluation Criterion:

1. RAWE-411:

- **General Orientation and Village Attachment (1+8 weeks)**

Assessment Parameters	Evaluators	Max. Marks (100)
Regularity/Conduct	Group Incharge	S/US
Innovative ideas to disseminative information	Group Incharge	S/US
Report Writing Skill	Departmental Committee	65
Open Presentation/Viva Voce	Departmental Committee/ External Examiner	35

2. RAWE-412: Plant Clinic (3 weeks)

Assessment Parameters	Evaluators	Max. Marks (100)
• Discipline (Conduct & Regularity)	Group Incharge	S/US
• Problem observation, Inference and Prescription Writing	Group Incharge	S/US
• Sample collection & Preservation	Group Incharge/Clinic Curator	S/US
• Report Writing Skill	Departmental Committee	65
• Open Presentation/ Viva Voce	Departmental Committee /External Examier	35

3. AIA-413: Agro-Industrial Attachment (4 weeks)

4. AIA-414; Agro-Industrial Attachment (4 weeks)

Assessment Parameters	Evaluators	Max. Marks (100)
Discipline, Regularity	Industry officials	S/US
Report Writing Skills	Departmental committee	65
Final Presentation/Viva Voce	Departmental committee and External Evaluator	35

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*A student will opt for any two course codes under Agro-Industrial Attachment (AIA-413 & AIA-414) out of the following:				
Sr. No.	**Course Title AIA**	**Course Code AIA**	**No. of weeks**	**Modules**
1.	Agro-industrial Attachment	Agron.	3	(i) Seed Industries Herbicides Formulators
2.	Agro-industrial Attachment	Entomology	3	Commercial Honey Production, Hive and Apicultural Equipment and Honey Processing Manufacturing Units: Honey Trading, Processing, Packaging, Exporting and Marketing Units.
3.	Agro-industrial Attachment	Ent.Plant. Pathology	3	Pesticide and Biopesticide Industries Biocontrol Agents Production Units Plant Quarantine Station Virus free Potato Tuber Production Units
4.	Agro-industrial Attachment	Ext. Edu	3	NGOs and SHGs in Agriculture Extension Services of CAO, Deputy Director(Horticulture), Soil Conservation, PAMETI, ATMA, Markfed, DRDA, etc.
5.	Agro-industrial Attachment	Flori	3	Commercial Flower Nurseries Flower Marketing Firms Flower Seed Production and Landscaping Units.
6.	Agro-industrial Attachment	Forest	3	Forest Based Industry High- tech Nursery (Tree Planting Stock Production)
7.	Agro-industrial Attachment	Horticulture	3	Commerial Fruit Nurseries
8.	Agro-industrial Attachment	PBG	3	Commercial Hybrid Seed Production Units
9.	Agro-industrial Attachment	Soil	3	Fertilizer Industries Vermicompost Units Biofertilizer Units
10.	Agro-industrial Attachment	Vegetable	3	Commercial Vegetable Nurseries Farms of Progressive Vegetable Growers
11.	Agro-industrial Attachment	Agri. Eco.	3	Agricultural Finance Institutions, Commercial Banks, Cooperative Banks, Cooperative Agricultural Service Societies (CASS), Market Committees.
12.	Agro-industrial Attachment	ABM	3	Agribusiness Industry in Public/Private Sector for Agribusiness Management Practices/Processes.
13.	Agro-industrial Attachment	Micro	3	Mushroom Production Units
14.	Agro-industrial Attachment	Horti/FT	3	Post harvest processing and value added units. Sugar units, Milk plants

B.Sc. (Hons.) Agriculture. Semester – VII & VIII
Group-B
Experiential Learning Programmes

Course objectives of ELMs:

To help students:

1. Learn by hands on training and gets entrepreneurial skills.
2. Acquire capacity building & ability to work in project mode, acquire business management capabilities and undertake self-employment in vocation of their ELMs.

Modules for skill development and entrepreneurship. A student has to register for two modules from the following package of modules: (Any two)

Mushroom Production Technology (ELM- 422): Introduction of Mushroom, Morphology of typical mushroom, Different type of mushroom, Life cycle of mushroom, Nutritional value of mushroom, Importance of mushroom cultivation, Status of cultivation of mushrooms in world, Status of cultivation of mushrooms in world India and in Punjab, Isolation techniques for getting pure cultures and their maintenance, Culture collection centres, Classification of Mushroom, Edible and non-edible mushrooms, Button mushroom or *Agaricus bisporus*, Construction of Shed, Compost preparation, Spawning, Preparation of Casing mixture, Fruiting and pinning, cropping and harvesting, Cultivation of Oyster mushroom or *Pleurotus* spp, Methodology of Paddy straw mushroom (*Volveriella volvaceae*), Cultivation of Milky mushroom (*Calocybe indica*), Cultivation of *Lentinus* edodes, Diseases of mushroom, Pest of mushroom, Harvesting, Post-Harvest management, Value added products and Marketing of mushroom.

Soil, Water, Seed & Plant Testing (ELM-423): Soil and plant sampling, different land use system, clod method, plant Nitrogen determination, Soil Nitrogen determination, bulk density by weighing bottle Method, PAU gauge Method, Plant phosphorus estimation, International pipette Apparatus, DTPA for micronutrients Analysis. TDS, salinity and pH Measurement, Soil Phosphorus measurement by Calorimeter, Titration, Organic carbon estimation, Method of mixing and dividing, Performing the Seed germination test.

Commercial Beekeeping (ELM-424): Important species of honey bees, Caste differentiation, Body structure, Handling of colonies, Food storage pattern, Study and maintenance of Langstroth hive, Preparation of frames and fixing of sheets, Study of bee flora, Colony division, Mass rearing techniques of queen bee, Queen marking, Seasonal management practices, Enemies of honey bees, Royal jelly extraction, Honey extraction, Beewax extraction, Propolis extraction, Honey testing, Visit to apiaries.

Floriculture and Landscaping (ELM-425): Introduction of Floriculture and Landscaping. Identification of Ornamental Trees, Ornamental Shrubs, Ornamental Climbers, Ornamental Annuals, Ornamental Bulbous plants and Shade loving plants; Identification of garden tools and their uses; Types of Containers and Pots; Types of Garden; Layout of garden. Nursery raising of flowers and ornamental plants; Propagation methods; Propagation of important flowers; Lawn management; Training and Pruning; Bonsai and Topiary making; Seed production. Post- harvest handling of cut flowers and cut foliage; Floral arrangement and making of ornamental bouquet; Preparation of bottle garden and Terrarium; Dry flower making. Indoor gardening; Vertical and Roof gardening and Visit to Garden park

Commercial Horticulture (ELM-426): Lfand measurement by karam method, Different types of growing media, Propagation structures, Types of bed preparation, Preparation of different types of Cuttings and its plantation on flat bed, Training and pruning in orchard, Preparation of Bordeaux paste and its application phalsa, pear & peach orchard, Nursery raising of different flowers, Pit digging for establishment of fruit orchard, Girdling in grape orchard, Intercultural operations for orchard management , Canopy management of guava orchard, Budding & its types, Grafting & its types, Layering & its types, Transplanting of flower seedling in polybags, Debloosming in Kinnow orchard, Preparation of ring basin around citrus plant, Flower thinning in fruit trees, Different techniques use in propagation plant to promote bud growth, Examine fruits of citrus species & extraction of seeds, Mulching and its role, Staking in indeterminate type of tomato, Nursery visit by students, Labelling of different varieties of fruit crops.

Food Processing (ELM-427): Introduction to food processing, food preservation and its basic principles, Blanching and its importance, Syrup and brine preparation, Importance of gluten content and its determination, Oil extraction using mechanical expeller and determination of oil yield and acid value of oil, Differences between sprouting and germination, Wheatgrass juice processing, Preparation of pickles (brine based, oil based, vinegar based), Processing of tomato based products (tomato puree, paste, ketchup and chutney), Quality evaluation of cereal products, Jam, jelly and marmalade making. Role of different ingredients in jam making, Introduction to canning of fruits and vegetables, Principle of drying and preparation of dehydrated fruits and vegetables, Potato chips processing, Preparation of squash, syrup or sharbat, Preparation of fruit/vegetable chutney, preparation of Aam papad or fruit leather. Preserve/Murabba and candy making. Role of different ingredients in baking, preparation of eggless muffins, baked crackers, biscuits and cakes. By product utilization of fruit/vegetable peels in various products.

Organic Production Technology (ELM-428): : Introduction, history and concept of organic production,present status of organic farming, principles of organic farming, components of organic farming, nutrient composition, nutrient management, weed management, pest and disease management, organic production of fruits and vegetables, rice, wheat, sugarcane, broccoli and maize.

Vegetable Production Under Protected Environment (ELM-429): Introduction to vegetables and protected cultivation, classification and designs of polyhouse, crop production factors, salient features of low cost ideal naturally ventilated polyhouse, site selection, orientation of polyhouse, selection of vegetable crops, acquaintance with nursery raising structures, production of off-season nursery of cucurbits in polybags, hi-tech nursery production technology, hardening of seedlings, production of vegetable nursery under portable low plastic tunnels, field and bed preparation in polyhouse, role of plastic mulch, transplanting of high value crops under protected environment, drip irrigation and fertigation, staking and training of high value vegetable crops, pinching in sweet pepper, vegetable seed production, plastic low tunnel technology for off-season cultivation of cucurbits, nematode problems and their management, integrated pest and disease management, storage of vegetables in zero energy cool chambers, hydroponics and aeroponics: an advanced approach for soilless vegetable production, protected cultivation of tomato, cucumber & capsicum, economics of cultivation of potential vegetable crops in polyhouses.

Course Outcomes of ELMs:

The students:

1. Develop skills self confidence to leadership to run a vocation.
2. Learn to be self employed, be in Agri-preneur/initiate a START UP based on ELM training acquired

B.Sc. (Hons.) Agriculture. Semester – VII & VIII

Evaluation criterion to be followed for each training component (ELM-421-ELM-429)

Parameters	Evaluators	Max. Marks (100)
Discipline, Conduct & Regularity	Course Coordinator/Instructor	S/US
Monthly Assessment	Course Coordinator/Instructor	S/US
Business Marketing/ Networking skills	Course Coordinator/Instructor	S/US
Report Writing Skills	Department Committee	65
Final Presentation/ Viva Voce	Department Committee	35

Attendance during trainings:

The minimum attendance required for all trainings will be 80 percent (as per the college minimum requirement). The attendance of students will be maintained by respective training and course coordinators for Sem-VII (RAWE-411, RAWE-412, RAWE-413, AIA-414, AIA-415) and Sem-VIII (ELM-421 & ELM-422) communicated to the office for final evaluation. The students will be eligible for final evaluation only when the attendance requirements are met with. Any student falling short of attendance has to register again with the concerned establishment/ course coordinator.