



Evaluation Scheme & Syllabus

Of

Bachelor of (Hons.) Agriculture (I Year)

(w.e.f. Academic Session 2018-19)

Department of Agriculture

INVERTIS UNIVERSITY - INVERTIS VILLAGE

Bareilly-Lucknow NH-24, Bareilly

Programme Outcomes of B.Sc. (Hons.) agriculture:

After completion of the program of B.Sc. in (Hons.) Agriculture, every student will know the following attributes:

PO1: Agriculture scenario of India and world.

PO2: They will know the crops, weeds, insect and diseases.

PO3: They will learn different resources both natural and artificial and their rational utilization

PO4: They will know seed to seed process i.e. production to marketing and value addition

PO5: They will learn marketing skill and commercial management of agricultural farms.

PO6: They will gain knowledge both on agriculture enterprises and related enterprises

PO7: They will have good communication skills and personality

PO8: They will be eligible to start their own agricultural based business or industries

PO9: They will have good knowledge of seeds and their production techniques

Discipline-wise Courses

S.No	Course Code	Course Title	Credit Hours
Agromony			
1.	BAG 106	Fundamentals of Agronomy	4(3+1)
3.	BAG 301	Crop Production Technology – I (<i>Kharif</i> crops)	2(1+1)
4.	BAG 409	Introductory Agro-meteorology & Climate Change	2(1+1)
5.	BAG 401	Crop Production Technology – II (<i>Rabi</i> crops)	2(1+1)
6.	BAG 407	Farming System & Sustainable Agriculture	1(1+0)
7.	BAG 591	Practical Crop Production - I (<i>Kharif</i> crops)	2(0+2)
8.	BAG 507	Geoinformatics and Nanotechnology and Precision Farming	2(1+1)
9.	BAG 010	Weed Management	3(2+1) *
10.	BAG 691	Practical Crop Production - II (<i>Rabi</i> crops)	2(0+2)
11.	BAG 607	Principles of Organic Farming	2(1+1)
12.	BAG 601	Rainfed Agriculture & Watershed Management	2(1+1)
13.	BAG 011	System Simulation and Agro-advisory	3(2+1) *
Plant Breeding & Genetics			
14.	BAG 201	Fundamentals of Genetics	3(2+1)
15.	BAG 302	Fundamentals of Plant Breeding	3(2+1)
16.	BAG 406	Principles of Seed Technology	3(1+2)
17.	BAG 003	Commercial Plant Breeding	3(1+2)*
18.	BAG 506	Crop Improvement-I (<i>Kharif</i> crops)	2(1+1)
19.	BAG606	Crop Improvement-II (<i>Rabi</i> crops)	2(1+1)
20.	BAG 008	Micro propagation Technologies	3(1+2)*
Soil Science & Agricultural Chemistry			
21.	BAG 103	Fundamentals of Soil Science	3(2+1)
22.	BAG 404	Problematic soils and their Management	2(2+0)
23.	BAG 502	Manures, Fertilizers and Soil Fertility Management	3(2+1)
Entomology			
24.	BAG 207	Fundamentals of Entomology	4(3+1)
26.	BAG 006	Biopesticides& Biofertilizers	3(2+1)*
27.	BAG 504	Pests of Crops and Stored Grain and their Management	3(2+1)
28.	BAG 605	Management of Beneficial Insects	2(1+1)
Agricultural Economics			
29.	BAG 205	Fundamentals of Agricultural Economics	2(2+0)
30.	BAG 303	Agricultural Finance and Co-Operation	3(2+1)
31.	BAG 408	Agricultural Marketing Trade & Prices	3(2+1)
32.	BAG 001	Agribusiness Management	3(2+1)*
33.	BAG 608	Farm Management, Production & Resource Economics	2(1+1)

Agricultural Engineering			
34.	BAG 203	Soil and Water Conservation Engineering	2(1+1)
35.	BAG 305	Farm Machinery and Power	2(1+1)
36.	BAG 403	Renewable Energy and Green Technology	2(1+1)
37.	BAG 602	Protected Cultivation and Secondary Agriculture	2(1+1)
Plant Pathology			
38.	BAG 206	Fundamentals of Plant Pathology	4(3+1)
39.	BAG 503	Diseases of Field and Horticultural Crops and their Management-I	3(2+1)
40.	BAG 603	Diseases of Field and Horticultural Crops and their Management-II	3(2+1)
41.	BAG 501	Principles of Integrated Pest and Disease Management	2(1+1)
Horticulture			
42.	BAG 101	Fundamentals of Horticulture	2(1+1)
43.	BAG 306	Production Technology for Vegetables and Spices	2(1+1)
44.	BAG 405	Production Technology for Fruit and Plantation Crops	2(1+1)
45.	BAG 402	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
46.	BAG 009	Hi-tech. Horticulture	3(2+1)*
47.	BAG 004	Landscaping	3(2+1)*
48.	BAG 604	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
Food Science & Technology			
49.	BAG 609	Principles of Food Science & Nutrition	2(2+0)
Agricultural Extension and Communication			
50.	BAG 110	Rural Sociology & Educational Psychology	2(2+0)
51.	BAG 208	Fundamentals of Agricultural Extension Education	3(2+1)
52.	BAG 209	Communication Skills and Personality Development	2(1+1)
53.	BAG 505	Entrepreneurship Development and Business Communication	2(1+1)
54.	BAG 012	Agricultural Journalism	3(2+1)*
Biochemistry / Physiology / Microbiology/ Environmental Sciences (Basic Science)			
55.	BAG 204	Fundamentals of Crop Physiology	2(1+1)
56.	BAG 202	Agricultural Microbiology	2(1+1)
57.	BAG 307	Environmental Studies & Disaster Management	3(2+1)
58.	BAG 102	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
	BAG104	Introduction to Forestry	2 (1+1)
Statistics, Computer Application and I.P.R.			
59.	BAG 308	Statistical Methods	2(1+1)
60.	BAG 304	Agri-Informatics	2 (1+1)
61.	BAG 508	Intellectual Property Rights	1(1+0)
Animal Production			

62.	BAG309	Livestock and Poultry Management	4(3+1)
Language			
63.	BAG 105	Comprehension & Communication Skills in English	2(1+1)
Remedial Courses			
64.	BAG 107	Introductory Biology	2(1+1)
65.	BAG 108	Elementary Mathematics	2(2+0)
2.	BAG 109	Agricultural Heritage	1(1+0)
Non-Gradial Courses			
	BAG 158	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
	BAG 111	Human Values & Ethics	1(1+0)
*: Elective course, 2(1+1)= 2 lecture per week (1 for lecture and 1 for practical)			

Semester: 7th

BAG751	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA)	
	Activities	No. of weeks
	General Orientation & On campus training by different faculties	1
	Village attachment	8
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5
	Plant clinic	2
	Agro-Industrial Attachment	3
	Project Report Preparation, Presentation and Evaluation	1
Total weeks for RAWE & AIA		20

Semester: 8th

Subject Code	Title of the module (ELP PROGRAMME)	Credits
BAG851	Production Technology for Bioagents and Biofertilizer	0+10
BAG852	Seed Production and Technology	0+10
BAG853	Mushroom Cultivation Technology	0+10
BAG854	Soil, Plant, Water and Seed Testing	0+10
BAG855	Commercial Beekeeping	0+10
BAG856	Poultry Production Technology	0+10
BAG857	Commercial Horticulture	0+10
BAG858	Floriculture and Landscaping	0+10
BAG859	Food Processing	0+10
BAG860	Agriculture Waste Management	0+10
BAG861	Organic Production Technology	0+10
BAG862	Commercial Sericulture	0+10

ELP:Experiential Learning Programme

Examination Scheme (First Semester)

I Semester (Credit hours distribution)			
S.No	Course Code	Course Title	Credit Hours
1.	BAG101	Fundamental of horticulture	2 (1+1)
2.	BAG102	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
3.	BAG103	Fundamentals of Soil Science	3 (2+1)
4.	BAG104	Introduction to Forestry	2 (1+1)
5.	BAG105	Comprehension & Communication Skills in English	2 (1+1)
6.	BAG106	Fundamentals of Agronomy	4(3+1)
7.	BAG107/BAG108	Introductory Biology*/ Elementary Mathematics*	2(1+1)/2(2+0)*
8.	BAG109	Agricultural Heritage*	1(1+0)*
9.	BAG110	Rural Sociology & Educational Psychology	2(2+0)
10.	BAG111	Human Values & Ethics (Non-gradial)**	1(1+0)
11.	BAG 158	NSS/NCC/Physical Education & Yoga Practices**	2(0+2)
TOTAL			18+03*+03**

*R: Remedial course; **NC: Non-gradial courses,3(2+1): 3 lectures per week, (2+1) :indicate 2 Lecture and one practical

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	FM
BAG101	Fundamental of horticulture	2	1	1	20	30	50	100	200
BAG102	Fundamentals of Plant Biochemistry and Biotechnology	3	2	1	20	30	50	100	300
BAG103	Fundamentals of Soil Science	3	2	1	20	30	50	100	300
BAG104	Introduction to Forestry	2	1	1	20	30	50	100	200
BAG105	Comprehension and Communication Skills in English	2	1	1	20	30	50	100	200
BAG106	Fundamentals of Agronomy	4	3	1	20	30	50	100	400
BAG 107	Introductory Biology*	2	1	1	20	30	50	100	200
BAG 108	Elementary Mathematics*	2	2	0	0	50	50	100	200
BAG109	Agricultural Heritage*	1	1	0	0	50	50	100	100
BAG110	Rural Sociology & Educational Psychology	2	2	0	0	50	50	100	200
BAG111	Human Values & Ethics (Non-gradial)**	1	1	0	0	50	50	100	0
BAG 158	NSS/NCC/Physical Education & Yoga Practices(Non-gradial)**	2	0	2	100	0	0	100	0
Total									2100
*R: Remedial course; **NC: Non-gradial courses, C-Credit, L-Lecture, P-Practical, UT-Unit test, ESM: End semester marks, FM-Final marks (TxC)									

BAG 101: FUNDAMENTAL OF HORTICULTURE

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To study about horticulture and its different branches.
2. To study the climate and soil required by different horticulture crops.
3. To study plant propagation methods and structures
4. To give an overview on unfruitfulness, pollination, fertilization and parthenocarpy
5. To give the knowledge of plant bio regulators in horticulture crops
6. To study cultivation of different aromatic and medicinal plants along with their uses

Syllabus**Theory**

Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants; 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.

Text and Reference books:

1. Jitendra Singh, Basic horticulture Kalyani Publications, New Delhi
2. Chadha, K.L. Handbook of Horticulture (2002) ICAR, New Delhi
3. Kaushal Kumar Mishra and Rajesh Kumar Fundamentals of Horticulture 2014. Biotech Books
4. Basra, A.S. Plant Growth Regulators in Agriculture & Horticulture: Their Role and commercial use IBD

Course Outcomes:**After completing the course, students will be able to:**

1. To get familiar with important horticulture trees
2. Preparation of quality planting material
3. Designing and shaping of trees
4. Learning about practices for cultivation of MAPs
5. Understand medicinal value of different plants

BAG102:FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY**Teaching Scheme**

Lectures and Practical: 3 hr./ week (2+1)
Tutorials: Nil
Credits: 3

Examination Scheme

Unit Test: 30Marks
Practical marks: 20Marks
End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of different types of biomolecules.
3. To explain the structure and function of plant constituents and components.
4. To describe all biological phenomena at molecular level.

Syllabus**Theory**

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterion nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

Text and Reference books:

1. Plant Biochemistry- V. Arun Kumar, N. Senthil Kumar and K. Siva Kumar.
2. A Textbook of Biotechnology, Revised Edition, 2014, R.C. Dubey, S. Chand Publishing Company, New Delhi
3. Principles of Biochemistry by Albert Lehninger, David Nelson and Michael Cox, Seventh Edition, 2017 Macmillan Publishers.

Course Outcomes:**After completing the course, students will be able to:**

1. Understand the core principles and topics of Biochemistry and their experimental basis
2. Understand the structures and functions of enzymes, proteins, carbohydrates, fats, process of metabolism.
3. Understand about the molecular basis of the action of genes and DNA .

BAG 103: FUNDAMENTAL OF SOIL SCIENCE

Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

- 1 To impart knowledge about basic concept of soil alumina silicate minerals.
2. To know the process of soil formation and soil classification.
3. To know the physical properties of soils and processes in relation to plant growth.
4. This course also familiarize student with soil colloids, ion exchange phenomenon, problems of soil irrigation water quality and soil environment quality

Syllabus

Theory

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources 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 - behaviour 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 by 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. Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil

Text and Reference books:

- 1.Fundamental of Soil Science.2012. Indian Society of Soil Science.2nd Edition.
- 2.Dilip Kumar Das.2015. Introductory Soil Science. Kalyani Publishers (4 edition).

Course Outcomes:

After completing the course, students will be able to:

1. Understand about soil its properties and linkage with crop production
2. Management of soils
2. Determination of different soil properties

BAG104: INTRODUCTION TO FORESTRY

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of different types of trees and other plants
3. To explain the Indian and International history of its development.
4. To describe all growth and development phases and losses to the forest
5. To give the knowledge of impotence of management and conservation of forest for society and earth.

Syllabus

Theory

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; 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; 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. Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, Taunya, 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 logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

Text and Reference books:

1. Indian Forestry by Manikandan and Jain, Kalyani publisher
2. Forest mensuration by A. N. Chaturvedi, L. S. Khanna, International Book Distributors

Course Outcomes:

After completing the course, students will be able to:

1. Understand the different types of plants and forest in nature or earth
2. Understand the methods for felling of trees and regeneration of crop.
3. Understand about the importance of protection and conservation of flora and fauna.
4. Understand the role of forest in global aspects.
5. Understand the basic concepts and the scope of forestry

BAG105: COMPREHENSION & COMMUNICATION SKILLS IN ENGLISH	
Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	Examination Scheme Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To provide an overview of prerequisites to Business Communication.
2. To put in use the basic mechanics of Grammar.
3. Analyze a variety of communication acts.
4. Ethically use, document and integrate sources.
5. Students will identify and explain their goals for the semester.
6. Identify the needs communication helps us meet.
7. Identify common misconceptions about communication
8. Explain communication competence
9. Identify the reasons we commit perceptual errors.
10. To impart the correct practices of the strategies of Effective Business Writing.

Syllabus

Theory

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw. Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing. The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

Practical

Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.

Course Outcomes:

After completing the course, students will be able to:

1. To draft effective business correspondence with brevity and clarity.
2. Students will be able to find, use, and evaluate primary academic writing associated with the communication discipline.
3. Students will be able to communicate effectively orally and in writing.
4. To demonstrate his Verbal and non-verbal communication ability through presentations.

BAG106: FUNDAMENTALS OF AGRONOMY

Teaching Scheme	Examination Scheme
Lectures and Practical: 4 hr./ week (3+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 4	End Semester Exam:50Marks

Course Objectives:

1. To impart basic knowledge of agronomy and its scope
2. To give an overview of different types of crops and their classification
3. To understand the production and classification of manures and fertilizers.
4. To impart knowledge on irrigation, its requirement and scheduling and methods of application
5. Identification, classification and management of weeds.

Syllabus

Theory

Agronomy and its scope, seeds and sowing, tillage and tith, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, logging.

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

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agroclimatic zones 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.

Text and Reference books:

1. Reddy, T.Yellamanda and Reddy, G.H. Sankara. 2016. Principles of Agronomy (2nd edition) , Kalyani Publishers, Ludhiana
2. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
3. Reddy, S.R.2012. Principles of Crop Production (4th edition), Kalyani Publishers, Ludhiana
4. Gupta , O.P. 2005. Weed Management: Principles and Practices (2nd Ed) Agribios (India) Jodhpur.
5. . De, Gopal Chandra 1989, Fundamentals of Agronomy. Oxford & IBH Publishing Co., New-Delhi.

Course Outcomes:

After completing the course, students will be able to:
1. Broad knowledge on different components of agriculture
2. Get acquainted with modern machines and agricultural tools
3. Managing inputs both monetary and non-monetary in a scientific manner
4. Learning about irrigation methods and its precise application
5. Preventing unproductive losses on and off the fields

BAG107: INTRODUCTORY BIOLOGY

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of different types of cells and organisms on earth
3. To give the formation history and origin of life on earth
4. To describe all types of plant and animal kingdom and their evolution

Syllabus

Theory

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division. Morphology of flowering plants. Seed and seed germination. Plant systematic- 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.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the levels of organization and related functions in plants and animals.
2. Understand the characteristics and basic needs of living individuals and their environment
3. Understand about the growth and development of organisms.
4. The student will be able to explain the importance of biodiversity at the genetic, organismal, community, and global scales.

BAG108: ELEMENTARY MATHEMATICS

Teaching Scheme	Examination Scheme
Lectures: 2 hr./ week (2+0) Tutorials: Nil Credits: 2	Unit Test: 50Marks End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give knowledge on basics of calculation and computation
3. Learning various methods and procedures of calculations
4. To understand and be able to use the language, symbols and notation of mathematics
5. Learn to solve systems of linear equations and application problems requiring them

Syllabus**Theory**

Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), 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, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral. 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) , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$. Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n , e^x , $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$ (Simple problems based on it).

Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).

Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.

Text and Reference books:

1. Krishi Ganita by Gokhroo and Jain
2. Differential Calculus by Gokhroo.
3. Integral Calculus by Gokhroo.
4. Shukla, R.K. and Kumar, K.2010. A Text Book Of Remedial Mathematics. A.B. Publication

Course Outcomes:**After completing the course, students will be able to:**

1. Development of skills in different aspect of mathematical procedures.
2. Develop mathematical curiosity and use inductive and deductive reasoning when solving problems.
3. Solve the matrix equation $Ax = b$ using row operations and matrix operations.

BAG109: AGRICULTURAL HERITAGE

Teaching Scheme Lectures: 1 hr./ week (1+0) Tutorials: Nil Credits: 1	Examination Scheme Unit test:50 End Semester Exam: 50 Marks
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Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of journey of Indian agriculture
3. To give knowledge on agriculture setup in India
4. To describe all the issues related to agriculture.

Syllabus

Theory

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; 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; Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

Text and Reference books

1. ICAR 1989 Handbook of Agriculture, Indian Council of Agricultural Research, New-Delh
2. Nene, Y.L. 2007. Glimpses of the Agricultural Heritage of India. Asian Agri-History Foundation, Secunderabad, Andhra Pradesh
3. Nene, Y.L., Choudhary, S.L. and Saxena, R.C. 2010. Textbook on Ancient History of Indian Agriculture, Asian Agri-History Foundation
4. Omprakash and S/Kumar.2019. Agriculture heritage, Rama publishing house.

Course Outcomes:

After completing the course, students will be able to:

1. Understanding the ancient agricultural practices.
2. Quittance with different ITK practices.
3. Knowing about agriculture education research and development setup in the country
4. Learning present issues and future prospects related to agriculture

BAG 110: RURAL SOCIOLOGY & EDUCATIONAL PSYCHOLOGY**Teaching Scheme**

Lectures: 2 hr./ week (2+0)

Tutorials: Nil

Credits: 2

Teaching Scheme

Lectures: 2 hr./ week (2+0)

Tutorials: Nil

Credits: 2

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of Panchayati raj system of India
3. To explain the difference between sociology and psychology

Syllabus**Theory**

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development. Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

Text and Reference books

1. Desai, A.R. 1978. Rural sociology in India. Bombay, Popular Prakashan, 5th Rev. ed.
2. Doshi, S.L. 2007. Rural sociology. Rawat Publishers, Delhi
3. Sharma O. P. and Somani L. L. 2012. Fundamentals of Rural Sociology and Educational Psychology. Agrotech Pub. Co., Udaipur.

Course Outcomes:**After completing the course, students will be able to:**

1. Understanding rural scenario of the country
2. Understanding traditional knowledge and its application
3. Understanding rural social structures
4. Understanding steps to elevate rural problems

BAG 111: HUMAN VALUE AND ETHICS

Teaching Scheme Lectures: 1 hr./ week (1+0) Tutorials: Nil Credits: 1	Examination Scheme Unit Test: 50 Marks End Semester Exam: 50 Marks
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Course Objectives:

- 1.To assist students in understanding the differences between values and skills in understanding the need, basic guidelines, content and the process of value education.
- 2.To help students initiate a process of dialog within themselves to understand what they 'really want to be' in their lives and professions
3. To help students understand the meaning of happiness and prosperity for human beings.
- 4.To help students understand harmony at all the levels of human living and to lead an ethical life.

Syllabus**Theory**

Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life. Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction. Decision Making. Motivation. Sensitivity. Success. Selfless Service. Case Study of Ethical Lives. Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient.
Examination

Course Outcomes:**After completing the course, students will be able to:**

- 1.Understanding truth of life, family and social values
2. Understanding stress and its management
3. Preparing and planning to be a good citizen

BAG 158:PHYSICAL EDUCATION & YOGA PRACTICES

Teaching Scheme	Examination Scheme
Lectures: 2 hr./ week (0+2) Tutorials: Nil Credits: 2	Practical marks: 100 Marks

Course Objectives:

1. Aims at evoking social consciousness among students through various activities viz., working together.
2. To reduce the gap between educated and uneducated community.
3. To make student aware about the benefits of health.
4. To develop self-employment ability among the students.

Practical:

Course aims at evoking social consciousness among students through various activities viz., working together, constructive and creative social work, to be skillful in executing democratic leadership, developing skill in programme development to be able for self employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

Physical Education and Yoga Practices Credit hours: 2(0+2)

Semester I: Physical Education and Yoga Practices

Semester I: Physical Education and Yoga Practices

1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
3. Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game
4. Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation
6. Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game
7. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas – demonstration, practice, correction and practice
13. Teaching of some more of Asanas – demonstration, practice, correction and practice

14. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
15. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
16. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
17. Teaching – Meaning, Scope and importance of Physical Education
18. Teaching – Definition, Type of Tournaments
19. Teaching – Physical Fitness and Health Education
20. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).

Semester II: Physical Education and Yoga Practices

1. Teaching of skills of Hockey – demonstration practice of the skills and correction.
2. Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation
3. Teaching of advance skills of Hockey – demonstration practice of the skills and correction.
Involvement of all the skills in games situation with teaching of rules of the game
4. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction.
5. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction.
Involvement of the skills in games situation
6. Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
7. Teaching of different track events – demonstration practice of the skills and correction.
8. Teaching of different track events – demonstration practice of the skills and correction.
9. Teaching of different track events – demonstration practice of the skills and correction with competition among them.
10. Teaching of different field events – demonstration practice of the skills and correction.
11. Teaching of different field events – demonstration practice of the skills and correction.
12. Teaching of different field events – demonstration practice of the skills and correction.
13. Teaching of different field events – demonstration practice of the skills and correction with competition among them.
14. Teaching of different asanas – demonstration practice and correction.
15. Teaching of different asanas – demonstration practice and correction.
16. Teaching of different asanas – demonstration practice and correction.
17. Teaching of different asanas – demonstration practice and correction.
18. Teaching of weight training – demonstration practice and correction.
19. Teaching of circuit training – demonstration practice and correction.
20. Teaching of calisthenics – demonstration practice and correction.

Note: 1) Compulsory Uniform: Half pants, Tee Shirts, Shoes and socks all white (Girls will have white Tee Shirt and Track pants) 2) The games mentioned in the practical may be inter changed depending on the season and facilities.

Course title : Educational Tour: 2 (0+2)

Examination Scheme (II Semester)

II Semester (Credit hours distribution)			
S.No	Course Code	Course Title	Credit Hours
1.	BAG 201	Fundamental of Genetics	3 (2+1)
2.	BAG 202	Agricultural Microbiology	2 (1+1)
3.	BAG203	Soil and Water Conservation Engineering	2 (1+1)
4.	BAG204	Fundamentals of Crop Physiology	2 (1+1)
5.	BAG205	Fundamentals of Agricultural Economics	2 (2+0)
6.	BAG206	Fundamentals of Plant Pathology	4(3+1)
7.	BAG207	Fundamentals of Entomology	4(3+1)
8.	BAG208	Fundamentals of Agricultural Extension Education	3(2+1)
9.	BAG209	Communication Skills and Personality Development	2(1+1)
TOTAL CREDITS			24 (16+8)
3(2+1): 3 lectures per week, (2+1) :indicate 2 Lecture and one practical			

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	FM
BAG201	Fundamentals of Genetics	3	2	1	20	30	50	100	300
BAG202	Agricultural Microbiology	2	1	1	20	30	50	100	200
BAG203	Soil and Water Conservation Engineering	2	1	1	20	30	50	100	200
BAG204	Fundamentals of Crop Physiology	2	1	1	20	30	50	100	200
BAG205	Fundamentals of Agricultural Economics	2	2	0	0	50	50	100	200
BAG206	Fundamentals of Plant Pathology	4	3	1	20	30	50	100	400
BAG207	Fundamentals of Entomology	4	3	1	20	30	50	100	400
BAG208	Fundamentals of Agricultural Extension Education	3	2	1	20	30	50	100	300
BAG209	Communication Skills and Personality Development	2	1	1	20	30	50	100	200
Total									2400
C-Credit, L-Lecture, P-Practical, UT-Unit test, ESM: End semester marks, FM-Final marks (TXC)									

BAG 201: FUNDAMENTALS OF GENETICS

Teaching Scheme	Examination Scheme
Lecture and Practical: 3 hr./ week (2+1)	Unit Test: 30 Marks
Tutorials: Nil	Practical marks: 20 Marks
Credits: 3	End Semester Exam: 50 Marks

Course Objectives:

1. To study about mendelian concepts and principles of heredity.
2. To study the chromosome morphology, cell cycle and cell division.
3. To study the linkage and crossing over mechanisms
4. To give an overview on haploids and mutations.
5. To give the knowledge of protein synthesis, transcription and gene concepts.

Syllabus

Theory

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonemata, chromosome matrix, 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.

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. Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics. 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. 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, Practice on mitotic and meiotic cell division, 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.

Text and Reference books:

1. Singh, B.D. 2014. Fundamental of Genetics. Kalyani Publishing House, New Delhi.
2. Singh, B.D. 2001. Genetics. Kalyani Publishing House, New Delhi.
- P. Singh. Genetics. Kalyani Publishing House, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Understand concepts and principles of heredity.

2. Understand genetic architecture of chromosome and cell division (mitosis and meiosis)

3. Understand gene concepts and its role in crop improvement

4. Understand role of haploids and mutation on crop plants

5. Understand qualitative & quantitative traits

6. Understand about the transcription and translation process.

7. Understand allele interaction and linkage and crossing over techniques

BAG 202: AGRICULTURAL MICROBIOLOGY	
Teaching Scheme Lecture and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	Examination Scheme Unit Test: 30 Marks Practical marks: 20 Marks End Semester Exam:50 Marks

Course Objectives:

1. To study about prokaryotic and eukaryotic microbes.
2. To study the genetic recombination, conjugation, transduction, plasmids and transposon in bacterial cell.
3. To study the role of of microbes in soil fertility and crop production.
4. To give an overview on microbes in human welfare.

Syllabus

Theory

Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon.

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Practical

Introduction to microbiology laboratory and its equipment's; 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.

Text and Reference books:

1. Biswas, T.D. and Mukherjee, S.K. 1990. Text Book of Soil Sciences, Tata McGraw Hill Publishing Company Limited, New Delhi
2. Mukherjee, N. and Ghosh T. 1998. Agricultural Microbiology, Kalyani Publishers, New Delhi.
3. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R. 1997. Microbiology. Tata McGraw - Hill Edition, 1993. India.
4. Rangaswami, G. and Bagyaraj, D.J. 2010. IInd ed. Agricultural Microbiology. Prentice Hall of India Pvt. Limited, New Delhi

Course Outcomes:

After completing the course, students will be able to:

1. Understand prokaryotic and eukaryotic microorganisms.
2. Understand Bacteria cell structure chemoautotrophy and photo autotrophy
3. Understand genetic recombination, conjugation, transduction, plasmids and transposon in bacterial cell.
4. Understand carbon, nitrogen, phosphorus and Sulphur cycles
5. Understand biological nitrogen fixation in soil fertility
6. Understand role of biofertilizers, biopesticides and biofuel in human welfare.

BAG 203: SOIL AND WATER CONSERVATION ENGINEERING

Teaching Scheme	Examination Scheme
Lecture and Practical: 2 hr./ week (1+1)	Unit Test: 30 Marks
Tutorials: Nil	Practical marks: 20 Marks
Credits: 2	End Semester Exam: 50 Marks

Course Objectives:

1. To give complete knowledge and information about the subject.
2. To give an overview of different types of structure and design of conservation practices.
3. To explain the difference practices of soil and water conservation.
4. To describe all methods and practices of conservation.

Syllabus

Theory

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control its control measures.

Practical

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

Text and Reference Books

1. Land and Water Management Engineering. 1982. Murthy V.V.N. Kalyani Publishers, New Delhi.
2. Principles of Agricultural Engineering. Vol. II. 2012. Michael A.M. and T.P. Ojha. Jain Brothers, New Delhi.
3. Soil and Water Conservation Water Management. 2010. Mahnot, S.C., Singh P.K. and Chaplot, P.C., Apex Publication House, Udaipur.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the different types of soil and water conservation practices.
2. Understand the design of conservation practices.
3. Understand about the different terminology related to conservation practices.
4. Understand the methods and practices for conservation approach.

BAG 204: FUNDAMENTALS OF CROP PHYSIOLOGY

Teaching Scheme	Examination Scheme
Lecture and Practical: 2 hr./ week (1+1)	Unit Test: 30 Marks
Tutorials: Nil	Practical marks: 20 Marks
Credits: 2	End Semester Exam: 50 Marks

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of different types of pathways for growth of a plant.
3. To explain the nutrient requirement, its importance, function in a plant.
4. To describe the role of hormones in plant development.
5. To give the knowledge of the physical, chemical and biological functions of living plants.

Syllabus

Theory

Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C₃, C₄ and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Practical

Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration. Separation of photosynthetic pigments through paper chromatography. Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content. Measurement of photosynthetic CO₂ assimilation by Infra Red Gas Analyser (IRGA).

Text and Reference books

1. S. N. Pandey and B. K. Sinha (1995). Plant physiology. Vikas Publishing House Pvt. Ltd., new Delhi
2. L. Taiz and E. Zieger (2006). Plant Physiology. 4th Ed. Sinauer Associates.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the functions of a living organism or any of its parts.
2. Understand its importance in agriculture fields, medicine, food production and textiles.
3. Understand about the physiologists can expect jobs at agricultural industries, manufacturing industries, public and private sectors.

BAG 205: FUNDAMENTALS OF AGRICULTURAL ECONOMICS

Teaching Scheme	Examination Scheme
Lecture and Practical: 2 hr./ week (2+0) Tutorials: Nil Credits: 2	Unit test : 50 Marks End Semester Exam:50 Marks

Course Objectives:

1. To study about economics and its role in agriculture.
2. To study economic principles, with emphasis on their application to the solution of farm, agribusiness, and agricultural industry problems.
3. To study demand and supply theory and competitive environments.
4. To study about money and taxes.

Syllabus**Theory**

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.

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. Production: process, creation of utility, factors of 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, shut down and break even points.

Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socioeconomic determinants, current policies and programmes on population control.

Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure.

Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

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Text and Reference books:

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| <ol style="list-style-type: none">1. Bhavani Devi,P. Raghu Ram,S. SubbaReddy,T.V. Neelakanta Sastry, 2009, Agricultural economics, Oxford and IBH Co. Pvt. Ltd., , New Delhi.2. K. K. Dewett and J. D. Varma, 1986, Elementary Economic Theory, S. Chand & Company, New Delhi.3. Latika Sharma et al (2014) Principles of agricultural economics, Agrotech publishers, Udaipur. |
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Course Outcomes:
After completing the course, students will be able to:
1. Understanding agricultural set up and its financial management
2. Understanding farm management
3. Computation of economic and cost reduction
4. Rationalizing agricultural inputs and practices

BAG 206: FUNDAMENTALS OF PLANT PATHOLOGY

Teaching Scheme	Examination Scheme
Lecture and Practical: 4 hr./ week (3+1)	Unit Test: 30 Marks
Tutorials: Nil	Practical marks: 20 Marks
Credits: 4	End Semester Exam: 50 Marks

Course Objectives:

1. To study about importance, scope Plant Pathology.
2. To study the biotic, abiotic and mesobiotic causes of plants disease.
3. To explain the Disease Triangle.
4. To give an overview of growth and reproduction of plant pathogens.
5. To study mechanism of disease development by the pathogens
6. To know the methods of managements of plant disease.

Syllabus

Theory

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. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.

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, replication and transmission. Study of phanerogamic plant parasites.

Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera*, *Meloidogyne*, *Anguina*, *Radopholus* etc.)

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. 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.

Practical

Acquaintance with various laboratory equipment's 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. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. Study of phanerogamic plant parasites. Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting. Study of fungicides and their formulations.

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

Text and Reference books:

1. Chaube, H.S. and Pundhir, V.S.2005. Crop Disease and Their Management.PHI Learning Pvt. Ltd.
2. Singh, R.S.2007.Plant diseases. Medtech; 10 edition.
3. Singh, R.S. 2005. 4th ed. Principles of Plant Pathology. Oxford & IBH, New Delhi.
4. Nene, Y.L. 2015. Fungicides in Plant Diseases Control. Oxford & IBH published Co. Pvt. Ltd., New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Understand various causes/ factors affecting plant disease.
2. Understand interaction between plant and pathogen in relation to environment and time.
3. Understand about the morphology and life cycle of different plant pathogenic organisms e.g. Fungi, Bacteria etc.
4. Understand various sign and symptoms of Plant diseases.
5. Understand defense mechanism in plants (how they protect themselves from the disease).
6. Understand about the various principles and methods of plant disease management.

BAG 207: FUNDAMENTALS OF ENTOMOLOGY

Teaching Scheme	Examination Scheme
Lecture and Practical: 4 hr./ week (3+1)	Unit Test: 30 Marks
Tutorials: Nil	Practical marks: 20 Marks
Credits: 4	End Semester Exam: 50 Marks

Course Objectives:

1. To know about characteristics of class Insecta to dominate in Animal Kingdom
2. To know about morphology and physiology of Insects.
3. To explain about Environmental factors affecting insect life cycle and their infestation.
4. To give knowledge of different categories of pest and their recent methods of control.
5. To give detail account of concept, scope, practices and limitation of Integrated Pest Management

Syllabus**Theory****Part – I**

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, 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, secretory (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

Part-II

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors—temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance.

Part III

Categories of pests. 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 feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.

Part – IV

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, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigoniidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata: Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturniidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae.

Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Practical

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; 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.

Text and Reference books:

1. Chapman .R.F.1981. Insect Structure and Function, ELBS Publishers New Delhi.
2. [K.N. Ragumoorthi](#), [V. Balasubramani](#), [M.R. Srinivasan](#).2017. Insecta An Introduction, A.E. Publications.
3. Mathur and Upadhyay, 2005. A Text Book of Entomology, Aman Publishing House, Meerut.
4. Pant. N.C. and Ghai, S. 1981. Insect Physiology and Anatomy, ICAR, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

- | |
|---|
| 1. Understand that due to the great diversity, remarkable adaptability and genetic flexibility of insects, made them dominant species on the Earth. |
| 2. Understand the characteristics of the phylum Arthropoda and class insecta. |
| 3. Able to understand economic importance of insects. |
| 4. Recognize the major taxonomic Orders of Insect and their key characteristics. |
| 5. Identify harmful insect pest and understand their morphology and physiology. |
| 6. Understand the concept, scope and limitation of IPM. |
| 7. Understand about various environmental factors affecting insects and their biology. |
| 8. Familiar about the pesticide and their use in the crops. |

BAG 208: FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION

Teaching Scheme	Examination Scheme
Lecture and Practical: 3 hr./ week (2+1)	Unit Test: 30 Marks
Tutorials: Nil	Practical marks: 20 Marks
Credits: 3	End Semester Exam:50 Marks

Course Objectives:

1. The course is intended to orient the students with the concept of extension education and its importance in agriculture development
2. Expose the students with various rural development programmes aimed at poverty alleviation
3. To know about the extension system worldwide and new dimensions of Agricultural Extension in India
4. To Understand dimensions and process of extension and programme planning

Syllabus**Theory**

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: 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: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, 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: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; 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.

Practical

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipment's 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; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level. Visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to 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.

Text and Reference books:

1. Adivi Reddy, A., 2001, Extension Education, Sree Lakshmi press, Bapatla.
2. Dahama, O. P. and Bhatnagar, O. P., 1998, Education and Communication for Development, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
3. Jalihal, K. A. and Veera bhadraiah, V., 2007, Fundamentals of Extension Education and Management in Extension, Concept publishing company, New Delhi.

Course Outcomes:**After completing the course, students will be able to:**

1. Learn different methods of agriculture technology transfer
2. Methods to be conducted on farm research
3. Bridging the gaps between farmers and researchers
4. Getting feedback to improvise the research activities.

BAG 209: COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Teaching Scheme	Examination Scheme
Lecture and Practical: 2 hr./ week (1+1)	Unit Test: 30 Marks
Tutorials: Nil	Practical marks: 20 Marks
Credits: 2	End Semester Exam:50 Marks

Course Objectives:

1. Develop awareness of appropriate communication strategies.
2. Prepare and present messages with a specific intent.
3. Analyze a variety of communication acts.
4. Ethically use, document and integrate sources.
5. Students will identify and explain their goals for the semester.
6. Identify the needs communication helps us meet.
7. Identify common misconceptions about communication
8. Explain communication competence
9. Identify the reasons we commit perceptual errors.
10. Identify the reasons people use language

Syllabus**Theory**

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.

Text and Reference books:

1. Sandhu, A. S. (1999). Textbook on Agricultural Communication; process and methods oxford RIBH Publishing co. Pvt. Ltd. New Delhi.
2. Berlo, David K. (1960). The process of Communication. NwYark, Holt, Rinehart and Winston Inc.
3. Dahama, O. P. and Bhatnagar, O.P., 1998, Education and Communication for Development, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
4. Verma, K.C. 2013. The Art of Communication. Kalpaz.
5. Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd. New Delhi.
6. Sharma R C and Krishna Mohan. 1978. Business Correspondence. Tata Mc Graw Hill

Course Outcomes:

After completing the course, students will be able to:

1. Students will be able to understand and apply knowledge of communication and language processes as they occur across various contexts, e.g., interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication etc. from multiple perspectives.

2. Students will be able to understand and evaluate key theoretical approaches used in the interdisciplinary field of communication. I.e., students will be able to explain major theoretical frameworks, constructs, and concepts for the study of communication and language, summarize the work of central thinkers associated with particular approaches, and begin to evaluate the strengths and weaknesses of their approaches.

3. Students will be able to find, use, and evaluate primary academic writing associated with the communication discipline.

4. Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others. Such skills could include communication competencies such as managing conflict, understanding small group processes, active listening, appropriate self-disclosure, etc.

5. Students will be able to communicate effectively orally and in writing.



Evaluation Scheme & Syllabus

Of

Bachelor of (Hons.) Agriculture (II Year)

(w.e.f. Academic Session 2018-19)

Department of Agriculture

INVERTIS UNIVERSITY - INVERTIS VILLAGE Bareilly-

Lucknow NH-24, Bareilly

Examination Scheme (Third Semester)

III Semester (Credit hours distribution)			
S.No	Course Code	Course Title	Credit Hours
1.	BAG301	Crop Production Technology – I (<i>Kharif</i> Crops)	2 (1+1)
2.	BAG302	Fundamentals of Plant Breeding	3(2+1)
3.	BAG303	Agricultural Finance and Cooperation	3 (2+1)
4.	BAG304	Agri- Informatics	2 (1+1)
5.	BAG305	Farm Machinery and Power	2 (1+1)
6.	BAG306	Production Technology for Vegetables and Spices	2(1+1)
7.	BAG307	Environmental Studies and Disaster Management	3(2+1)
8.	BAG308	Statistical Methods	2(1+1)
9.	BAG309	Livestock and Poultry Management	4(3+1)
TOTAL			23 (14+9)

3(2+1): 3 lectures per week, (2+1): indicate 2 Lecture and one practical

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	FM
BAG301	Crop Production Technology – I (<i>Kharif</i> Crops)	2	1	1	20	30	50	100	200
BAG302	Fundamentals of Plant Breeding	3	2	1	20	30	50	100	300
BAG303	Agricultural Finance and Cooperation	3	2	1	20	30	50	100	300
BAG304	Agri- Informatics	2	1	1	20	30	50	100	200
BAG305	Farm Machinery and Power	2	1	1	20	30	50	100	200
BAG306	Production Technology for Vegetables and Spices	2	1	1	20	30	50	100	200
BAG307	Environmental Studies and Disaster Management	3	2	1	20	30	50	100	300
BAG308	Statistical Methods	2	1	1	20	30	50	100	200
BAG309	Livestock and Poultry Management	4	3	1	20	30	50	100	400
Total									2300
C-Credit, L-Lecture, P-Practical, , UT-Unit test, ESM: End semester marks, FM-Final marks (TxC)									

BAG301: CROP PRODUCTION TECHNOLOGY – I (KHARIF CROPS)

Teaching Scheme Lectures and Practical: 2 hr./week (1+1) Tutorials: Nil Credits: 2	Examination Schemes Unit Test: 30 Marks Practical marks :20 Marks End Semester Exam:50 Marks
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Course Objectives:

- 1.To know the origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops.
- 2.To identify weeds in *kharif* season crops.
- 3.To understand the yield attributing characters of *kharif* crops and Estimate yield of *Kharif* crops.
- 4.Basic knowledge of production technology of *Kharif* crops

Syllabus**Theory**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals-rice, maize, sorghum, pearl millet and finger millet, pulses-pigeonpea, mungbean and urdbean; oilseeds- groundnut, and soybean; fibre crops-cotton & jute; forage crops-sorghum, cowpea, cluster bean and napier.

Practical

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and 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 centers of related crops.

References:

1. Singh, Chhidda, Singh, Prem and Singh, Rajbir. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
4. Singh, S.S.and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.
5. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
6. Prasad, Rajendra. 2002. Text Book of Field Crops Production, ICAR, New Delhi.

Course Outcomes:**After completing the course, students will be able to:**1. Student will be able to plan and manage cultivation of *Kharif* crops

2. Identify seasonal weeds and their management.

3. Detailed knowledge on geographical adaptation of crops and their cultivation practices

4. Quality and other important constituents, storage management and important varieties of different crops

BAG302- FUNDAMENTALS OF PLANT BREEDING

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit Test: 30 Marks Practical marks :20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To study the principle, objective, methods and use of plant breeding
2. Acquaintance with concept, nature and role of plant breeding, major achievements and future prospects.
3. Genetics in relation to plant breeding, modes of reproduction and apomixes, self – incompatibility and male sterility- genetic consequences, cultivar options.
4. Plant Breeder's kit, Study of germplasm of various crops.
5. Study of floral structure of self-pollinated and cross-pollinated crops.
6. Emasculation and hybridization techniques in self- & cross-pollinated crops.

Syllabus

Theory

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/ diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and prebreeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights

Practical

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, Handling of segregation populations, Methods of calculating mean, range, variance, standard deviation, heritability, Designs used in plant breeding experiments, 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.

Text and Reference books:

1. Essentials of Plant Breeding, Phundhan Singh, Kalyani Publishers 2018
2. Plant Breeding, Principles and methods, Kalyani Publishers 2017
3. Alard, R.W. 2000. Principles of Plant Breeding. John Willey & Sons, New York.
4. Chahel, G.S. and S.S. Ghosal. 2002. Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
5. Singh, B.D. 2005. Plant Breeding. Kalyani Publishing House, New Delhi.
6. Singh, P. 2001. Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.
7. Jain, H.K. and M.C. Kharkwal. 2004. Plant Breeding- Mendelian to Molecular Approach. Narosa Publishing House, New Delhi.
8. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.
9. Shekhawat, S. S. (ed) (2016). Advances and Current Issues in Agriculture, Vol. III. Shiksha Prakashan, S. M. S. Highway, Jaipur.

Course Outcomes:**After completing the course, students will be able to:**

1. Acquaintance with concept, nature and role of plant breeding, major achievements and future prospects
2. Genetics in relation to plant breeding, modes of reproduction and apomixes, self – incompatibility and male sterility- genetic consequences, cultivar options.
3. Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross-pollinated crops.
4. Emasculation and hybridization techniques in self- & cross-pollinated crops.
5. Student will be able to understand different scientific methods to provide improved crop varieties to the farmers /mass.
6. Student will be able to understand advanced technology of plant breeding

BAG303-AGRICULTURAL FINANCE AND COOPERATION

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit Test: 30 Marks Practical marks :20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To study about agriculture finance and its role in Indian agriculture
2. To study about agriculture credit system.
3. To study the role of NABARD, RBI, World bank in Indian agriculture
4. To study the balance sheet and SWOT analysis

Syllabus**Theory**

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

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

Practical

Determination of most profitable level of capital use, Optimum allocation of limited amount of capital among different enterprise, Analysis of progress and performance of cooperatives using published data, Analysis of progress and performance of commercial banks and RRBs using published data, Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures, 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, Techno-economic parameters for preparation of projects, Preparation of Bankable projects for various agricultural products and its value added products, Seminar on selected topics.

References:

1. Johil, S.S. and C.V. More. 1970. Essentials of Farm Financial Management. Today and Tomorrow Printers and Publishers, New Delhi
2. John, J. Hampton. 1983. Financial decision making: Concepts, Problems and Cases of India. New Delhi

- 3.Mamoria,C.B. and R.D. Saksena. 1973. Co-Operatives in India.KitabMahal, Allahabad.
- 4.Mukhi, H.R. 1983. Cooperation in India and Abroad. New Heights Publishers, New Delhi.
- 5.S. Subba Reddy, P. Raghu Ram, 1996, Agricultural finance and management, Oxford & IBH Pub. Co, New Delhi.
- 6.Kamat, G.S., 1978, New Dimensions of Cooperative Management, Himalyan Publishing House, Mumbai.
- 7.Nelson and Murray, 1988. Agricultural Finance. Kalyani Publishers, New Delhi.
- 8.Pandey, U.K. 1990. An Introduction to Agricultural Finance, Kalyani Publishers, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

- 1.Detailed knowledge on Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture.
- 2.Agriculture credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits.
- 3.Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.
4. Student will able to understand scope and significance of Agriculture Finance.
5. Student will able to understand significance of cooperatives in Indian agriculture.

BAG304-AGRI- INFORMATICS

Teaching Scheme	Examination Schemes
Lectures and Practical: 2 hr./week (1+1)	Unit Test: 30 Marks
Tutorials: Nil	Practical marks :20 Marks
Credits: 2	End Semester Exam:50 Marks

Course Objectives:

1. Student will be aware with fundamental of computer and its different application
2. Will be able to understand the role of computer in agriculture
3. Use of ICT in agriculture
4. Will be able to operate different apps of smart phone related to agriculture like market price etc

Syllabus

Theory

Introduction to Computers, Operating Systems, definition and types, Applications of MSOffice for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations.

e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

Practical

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, Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document, MS-EXCEL - Creating a spreadsheet, 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, Introduction of Geospatial Technology for generating valuable information for Agriculture, Hands on Decision Support System, Preparation of contingent crop planning.

Reference:

- 1.G. Vanitha. Agriculture informatics. New India Publishing Agency
- 2.Subrat K Mahapatra, S.K.Mohanty, J. Bhuiya and JS. Pradhan: Introductory Agri- Informatics. Jain Brothers publication.

<p>3.Amit Deogirikar and SanchaliKshrisagar, A textbook of Agri-informatics: Shri RajlakshmiPrakashan, Aurangabad.</p> <p>4.John Walkenbach, Herb Tyson, Michael R.Groh, FaitheWempen, Microsoft Office 2010 Bible</p> <p>5.Bangia, LearningMs Office 2010</p> <p>6.Prof. Satish Jain and M.Geetha, MS-Office 2010 Training Guide</p> <p>7.Kate Shoup, Microsoft Office 2010</p> <p>8.Melanie Gass, It's All about You! Office 2010</p> <p>9.Nancy Conner and Matthew MacDonald, Office 2010: The Missing Manual</p>
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Course Outcomes:

After completing the course, students will be able to:
1.Basic knowledge on Computers
2.Anatomy of Computers, Memory Concepts, Units of Memory, Operating System, definition and types.
3.Applications of MS-Office for creating.
4.Editing and formatting a document. Student will able to learn computer application for the development of agriculture.
5.Student will able to learn IT tools for the development of agriculture.

BAG305: FARM MACHINERY AND POWER

Teaching Scheme	Examination Schemes
Lectures and Practical: 2 hr./week (1+1) Tutorials: Nil Credits: 2	Unit Test: 30 Marks Practical marks :20 Marks End Semester Exam:50 Marks

Course Objectives:

1. Basic knowledge of farm machinery and power
2. To acquaints with the IC engines and their working.
3. Will get familiarize with the different part of tractor.
4. Will learn to derive tractors.
5. Will get familiarize with different implements used in agricultural practices in field.

Syllabus

Theory

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

Practical

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, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow, Familiarization with seedcum- fertilizer drills their seed metering mechanism and calibration, planters and transplanter, Familiarization with different types of sprayers and dusters, Familiarization with different intercultural equipment, Familiarization with harvesting and threshing machinery.

References:

1. Principles of Agricultural Engineering. Vol. I. 2012. Michael, A.M. and T.P. Ojha. Jain Brothers, Jodhpur.
2. Farm Tractors, Maintenance and Repair.1989. Rai and Jain. Tata Mc Graw Hill Publ. New Delhi.
3. Elements of Farm Machinery.1989. Srivastava, A.C. Oxford IBH Publ. Company, New Delhi.
4. Elements of Agricultural Engineering, Vol. I & III. 1989. Singhal, O.P. Suraj Prakashan, Allahabad.
5. Element of Agricultural Engineering. 1990. Sahay, Jagdishwar. Agro. Book Agency, New Chitragupta Nagar, Patna.

Course Outcomes:

After completing the course, students will be able to:
1. Student will be able to understand use of different farm machinery in Agriculture.
2. Student will be able to understand significance of power to operate farm machinery.
3. Detailed knowledge on Status of Farm Power in India, Sources of Farm Power.
4. I.C. engines, working principles of IC engines, comparison of two stroke and four stroke cycle engines, fuel supply and hydraulic control system of a tractor.
5. Tractor types, Cost analysis of tractor power and attached implement.

BAG306-PRODUCTION TECHNOLOGY FOR VEGETABLES AND SPICES

Teaching Scheme Lectures and Practical: 2 hr./week (1+1) Tutorials: Nil Credits: 2	Examination Schemes Unit Test: 30 Marks Practical marks :20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. Basic knowledge of production technology of Vegetable and spices
2. To study the climate and soil required by different vegetable and spice crops.
3. To study methods and technology of production.

Syllabus**Theory**

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables)

Practical

Identification of vegetables & spice crops and their seeds, Nursery raising, Direct seed sowing and transplanting, Study of morphological characters of different vegetables & spices, Fertilizers applications, Harvesting & preparation for market, Economics of vegetables and spices cultivation.

References:

1. B.R. Choudhary A Text book on production technology of vegetables (2009) Kalyani Publishers
2. K S Yawalkar Vegetable crops in India (2008) Agri-Horticultural Pub. House. Nagpur
3. K. V. Kamath Vegetable Crop Production (2007). Oxford Book Company
4. M.S. Dhaliwal Handbook of Vegetable Crops (2008). Kalyani Publishers
5. P. Hazra Modern Technology in Vegetable Production (2011) New India Publishing Agency, New Delhi
6. Pruthi, J.S Minor Spices of India- Crop Management Postharvest Technology (2001) ICAR
7. S. Thamburaj Text book of vegetable, tuber crops and Spices (2014) ICAR

Course Outcomes:**After completing the course, students will be able to:**

1. To study about origin, area, production, improved varieties and cultivation practices.
2. Student will be able to understand importance of vegetable and spices in nutrition and economy
3. Student will be able to learn cultivation of vegetable and spices

BAG307-ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit Test: 30 Marks Practical marks :20 Marks End Semester Exam:50 Marks
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Course Objectives:

- 1.To get familiar with important terms of the subject
- 2.To get knowledge of Multidisciplinary nature of environmental studies Definition, scope and importance
3. To study about natural Resources, Renewable and non-renewable resources, Natural resources and associated problems.

Syllabus**Theory**

Multidisciplinary nature of environmental studies Definition, scope and importance
Natural Resources: Renewable and non-renewable resources, Natural resources and associate problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles. Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity and its conservation: Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer

depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

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

References:

1. Ecology and Environment- P D Sharma, 2010, Rastogi publication, Meerut- New Delhi
2. Environmental Science: A New Approach- Pushpa Dahiya, Manisha Ahlawat, 2013, Alpha Science
3. Fundamentals of environmental Sciences, Bamanayha B. R. Verma L. N. and Verma A., 2005, Yash publishing house, Bikaner
4. Disaster Management and Risk Reduction: *Role of Environmental Knowledge*, Editor(s): Anil K. Gupta, Sreeja S. Nair, Florian Bemmerlein-Lux, Sandhya Chatterji, 2013, Alpha Science
5. Environmental Biology, Agarwal K C, 1999, Agro Botanica, Bikaner

Course Outcomes:

After completing the course, students will be able to:

1. Knowledge of Multidisciplinary nature of environmental studies Definition, scope and importance.
2. Knowledge about natural Resources, Renewable and non-renewable resources, Natural resources and associated problems

BAG308- STATISTICAL METHODS

Teaching Scheme Lectures and Practical: 2 hr./week (1+1) Tutorials: Nil Credits: 2	Examination Schemes Unit Test: 30 Marks Practical marks :20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To study the mathematics dealing with the collection, organization, analysis, interpretation and presentation of data.
2. In applying statistics to, for example, a scientific, industrial, or social problem, to begin with a statistical population or a statistical model process to be studied.
3. Statistics deals with all aspects of data including the planning of data collection in terms of the design of surveys and experiments.

Syllabus**Theory**

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

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, Measures of Skewness & Kurtosis (Ungrouped Data), Moments, Measures of Skewness & Kurtosis (Grouped Data), 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 Variance Two Way Classification, Selection of random sample using Simple Random Sampling.

Text and Reference books:

1. Chandel, S.R.S. 1998. Handbook of Agril. Statistics. AchalPrakashan Mandir, Kanpur.
2. Gupta S.P. 2002. Statistical Methods. Sultan Chand & Sons, New Delhi.
3. Agarwal B.L. 1991. Basic Statistics Wiley Eastern, New Delhi.

Course Outcomes:**After completing the course, students will be able to**

1. Graphical Representation of Data.
2. Acquaintance with Statistics and its Applications in Agriculture
3. Field experimentation, data analysis and interpretation of result

BAG309-LIVESTOCK AND POULTRY MANAGEMENT

Teaching Scheme Lectures and Practical: 4 hr./week (3+1) Tutorials: Nil Credits: 4	Examination Schemes Unit Test: 30 Marks Practical marks :20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To understand the importance of farm animals.
2. To study characters of indigenous and exotic breeds of cattle, goat, buffalo, swine and poultry.
3. To study the management of farm animals, its nutrient requirement and its housing

Syllabus**Theory**

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry. 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. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

External body parts of cattle, buffalo, sheep, goat, swine and poultry, Handling and restraining of livestock, Identification methods of farm animals and poultry, Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records, Judging of cattle, buffalo and poultry, Culling of livestock and poultry, Planning and layout of housing for different types of livestock, Computation of rations for livestock, Formulation of concentrate mixtures, Clean milk production, milking methods, Hatchery operations, incubation and hatching equipments, Management of chicks, growers and layers, Debeaking, dusting and vaccination, Economics of cattle, buffalo, sheep, goat, swine and poultry production.

References:-

1. Banerjee, G.C. 2013. A Text Book of Animal Husbandry. 8th Ed. Oxford & IBH Pub.CO.PvtLtd.N-Delhi.
2. Devendra C and Mecleroy GB, 1982. Goat and Sheep Production in Tropics.
3. Sastry N S R and Thomas, Ck 2006. Livestock Production and Management, Kalyani.
4. Thomas CK and Sastry, NSR. 1991. Dairy Bovine Production. Kalyani.
5. ICAR, Handbook of Animal Husbandry, 2011. 3rd revised Ed.
6. Dimiri, U, Sharma, M C and Tiwari R. 2013. Swine production and Health Management. New India Pub Agency.
7. Singh, R A. 1996. Poultry Production 3rd Ed. Kalyani.
8. Prasad, J. 2008. Poultry Production and management. Kalyani Pub.

Course Outcomes:**After completing the course, students will be able to:**

1. Understood the importance of farm animals and its influence in rural economy
2. Gained knowledge on characteristics of indigenous and exotic breeds of cattle, goat, buffalo, swine and poultry
3. knowledge on management of farm animals, its nutrient requirement and its housing Reproduction in farm animals and poultry.
4. Housing principles.
5. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Examination Scheme (Fourth Semester)

VI Semester (Credit hours distribution)			
S.No	Course Code	Course Title	Credit Hours
1.	BAG401	Crop Production Technology –II (<i>Rabi Crops</i>)	2 (1+1)
2.	BAG402	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
3.	BAG403	Renewable Energy and Green Technology	2(1+1)
4.	BAG404	Problematic Soils and their Management	2 (2+0)
5.	BAG405	Production Technology for Fruit and Plantation Crops	2 (1+1)
6.	BAG406	Principles of Seed Technology	3(1+2)
7.	BAG407	Farming System & Sustainable Agriculture	1(1+0)
8.	BAG408	Agricultural Marketing Trade & Prices	3(2+1)
9.	BAG409	Introductory Agro-meteorology & Climate Change	2(1+1)
10.		Elective Course*	3 credits
TOTAL			19(11+8)+3
19(11+8)+3: 19 lectures per week, (11+8) : indicate 11 Lecture and 8 practical and 3- represent elective courses			

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	FM
BAG401	Crop Production Technology –II (<i>Rabi Crops</i>)	2	1	1	20	30	50	100	200
BAG402	Production Technology for Ornamental Crops, MAP and Landscaping	2	1	1	20	30	50	100	200
BAG403	Renewable Energy and Green Technology	2	1	1	20	30	50	100	200
BAG404	Problematic Soils and their Management	2	2	0	0	50	50	100	200
BAG405	Production Technology for Fruit and Plantation Crops	2	1	1	20	30	50	100	200
BAG406	Principles of Seed Technology	3	1	2	20	30	50	100	300
BAG407	Farming System & Sustainable Agriculture	1	1	0	0	50	50	100	100
BAG408	Agricultural Marketing Trade & Prices	3	2	1	20	30	50	100	300
BAG409	Introductory Agro-meteorology & Climate Change	2	1	1	20	30	50	100	200
	Elective Course*	3			20	30	50	100	300
Total									2200
C-Credit, L-Lecture, P-Practical, , UT-Unit test, ESM: End semester marks, FM-Final marks (TxC), Elective Course*: To be select from the elective course list									

BAG401: CROP PRODUCTION TECHNOLOGY –II (RABI CROPS)	
Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	Examination Scheme Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To study the origin, geographical distribution and economic importance of different *Rabi* crops.
2. To study the weeds, disease and pest of different crops and their management.
3. To study the cultivation and production of different medicinal and aromatic crops.
4. To study the extraction of essential oil from different parts of medicinal and aromatic plants.
5. To study cultivation practices of different fodder crops.

Syllabus

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rape seed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops- mentha, lemon grass and citronella, 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.

Text and Reference books:

- 1.Singh, Chhidda, Singh, Prem and Singh, Rajbir.2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
- 2.Singh, S.S.1998. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
- 3.Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
- 4.Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
- 5.Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
- 6.Prasad, Rajendra. 2002. Textbook of Field Crops Production, ICAR, New Delhi.
- 7.ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
- 8.Reddy, S.R. 2012. Agronomy of Field Crops. Kalyani Books, New Delhi.

Course Outcomes:

After completing the course, students will be able to:
1. Students will be able to know about the economic importance of medicinal and Aromatic crops in present sphere.
2. Will be able to identify weeds, pest and diseases along with their management.
3. It will be helpful to know about basic morphological characteristics of <i>Rabi</i> crops.
4. Input management of different crops.

BAG402: PRODUCTION TECHNOLOGY FOR ORNAMENTAL CROPS, MAP AND LANDSCAPING**Teaching Scheme**

Lectures and Practical: 2 hr./ week (1+1)

Tutorials: Nil

Credits: 2

Examination Scheme

Unit Test: 30Marks

Practical marks: 20Marks

End Semester Exam:50Marks

Course Objectives:

1. To study about ornamental, medicinal and aromatic plants
2. To study about landscaping and their principles.
3. To study plant technology of different flowers and medicinal plants.
4. To understand medicinal value of different crops
5. To study training and pruning of ornamental plants

Syllabus**Theory**

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping, Principles of landscaping. Landscape uses of trees, shrubs and climbers. Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. 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.

Text and Reference books:

- 1.A.K. Tiwari and R. Kumar Fundamentals of ornamental horticulture and landscape gardening (2012) New India
- 2 Arora, J.S. Introductory Ornamental Horticulture (2006) Kalyani Publishers
- 3 Atal, E. K. and Kapur, B. Cultivation and Utilization of Medicinal and Aromatic plants (1982) CSIR, New Delhi
- 4 Azhar Ali Farooqui and Sreeramu, B.S. Cultivation of medicinal and aromatic plants (2001) United Press Limited
- 5 Bimal das Chowdhury and Balai Lal Jana Flowering Garden trees (2014) Pointer publishers, Jaipur
- 6 Bose, T.K. Malti, R.G. Dhua, R.S. & Das, P. Floriculture and Landscaping (2004) Nayaprakash 7 Bose, T.K. and Mukherjee, D. Gardening in India (2004) Oxford & IBH Publishers 8 Chadha, K.L. and

Chaudhary, B. Ornamental Horticulture in India (1986) ICAR 9
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Course Outcomes:

After completing the course, students will be able to:

1. To evaluate natural herbal products from an economic perspective.
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2. To use medicinal and aromatic herbs sustainably.

3. To set up business related to medicinal, aromatic and landscaping.

4. To develop effective ideas related to collecting, processing and marketing herbal natural sources.

5. Understand medicinal value of different plants

BAG 403: RENEWABLE ENERGY AND GREEN TECHNOLOGY

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To study about energy sources and their contribution in agriculture.
2. To study biomass and its utilization in the production of biofuel.
3. To study about production of biodiesel, bio oil, bio alcohol etc.
4. To give an overview on unfruitfulness, pollination, fertilization and parthenocarpy
5. To study the utilization of solar energy in various aspects.
6. To study cultivation of different aromatic and medicinal plants along with their uses

Syllabus

Theory

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bio alcohol, biodiesel and biooil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier. To study the production process of biodiesel, To study briquetting machine. To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker. To study solar drying system. To study solar distillation and solar pond.

Text and Reference books:

- 1.G.D. Rai. Non-Conventional Energy Sources, Kh Publishers, New Delhi.
2. N. S. Rathore. A.K. Kurchania, N.L. Panwar. (2007). Non-Conventional Energy Sources, Himanshu Publications.
3. N.S. Rathore. A. K. Kurchania, N.L. Panwar. (2007). Renewable Energy, Theory and Practice, Himanshu Publications.
4. K.C. Khandelwal. & S.S. Mandi. (1990). Biogas Technology.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the role of renewable sources in agriculture sector
2. Understand the bio fuel production and their applications in today's world.

BAG 404: PROBLEMATIC SOILS AND THEIR MANAGEMENT

Teaching Scheme Lectures and Practical: 2 hr./ week (2+0) Tutorials: Nil Credits: 2	Examination Scheme Unit test :50 Marks End Semester Exam:50Marks
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Course Objectives:

1. To study about the quality and fertility of soil.
2. To study about the problematic soils of India along with their management.
3. To study about the wasteland present in India.
4. To give an overview on land capability classification.

Syllabus**Theory**

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

Irrigation water–quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils. Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystem.

Text and Reference books:

1. Bear FE. 1964. Chemistry of the Soil. Oxford & IBH.
2. Jurinak JJ. 1978. Salt-affected Soils. Department of Soil Science & Biometeorology. Utah State Univ.
3. USDA Handbook No. 60. 1954. Diagnosis and improvement of Saline and Alkali Soils. Oxford & IBH.
4. Abrol, I.P. and Dhurvanarayana, V.V. (1998) Technologies for wasteland development, ICAR, New Delhi-110012
5. Cirsan Paul, J.(1985) Principles of remote sensing. Longman, New York.
6. Richards, L.A. (1954). Diagnosis and improvement of saline and alkali soils. USDA Hand book No. 60, Washington, DC USA.
7. Somani, L.L. and Totawat, K.L. (1993). Management of salt affected soils and waters. Agrotech publishing Academy, Udaipur.

Course Outcomes:**After completing the course, students will be able to:**

1. Knowledge of different reclamation and management practices for the development of the soils.
2. Understand the different factors responsible for saline ,sodic and acidic soils and their properties
3. Capable of identifying problematic soils in India and their management

BAG 405: PRODUCTION TECHNOLOGY FOR FRUIT AND PLANTATION CROPS**Teaching Scheme**

Lectures and Practical: 2 hr./ week (1+1)

Tutorials: Nil

Credits: 2

Examination Scheme

Unit Test: 30 Marks

Practical Marks: 20 Marks

End Semester Exam:50Marks

Course Objectives:

1. To study production technology of major and minor fruits.
2. To study the cultivation of plantation crops.
3. To study the importance of fruit and plantation crops.

Syllabus**Theory**

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond and; minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops. Description and identification of fruit. Preparation of plant bio regulators and uses, Important pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.

Text and Reference books:

- 1 Bal, J.S. Fruit Growing (2010) Kalyani Publishers
- 2 Banday F.A. and Sharma M.K. Advances in Temperate Fruit Production (2010) Kalyani Publishers
- 3 Bose, T.K., Mitra, S.K. and Sanyal, D. Tropical and Sub-Tropical-Vol-I (2002) Nayaprakash, Kolkata
- 4 Chadha, T.R Text Book of Temperate Fruits (2001) ICAR Publication
- 5 Chattopadhyay T.K. A text book on Pomology-IV Devoted to Temperate fruits (2009) Kalyani Publishers
- 6 Das B.C and Das S.N . Cultivation of Minor Fruits Kalyani Publishers
- 7 K.L.Chadda Advanced in Horticulture (2009) Malhotra Publishing House, New Delhi
- 8 Kumar, N.J.B. M. Md. Abdul Khaddar, Ranga Swamy, P. and Irrulappan, I. Introduction to spices, Plantation crops and Aromatic plants (1997) Oxford & IBH, New Delhi
- 9 Radha T and Mathew L. Fruit crops (2007) New India Publishing Agency 10 S.P. Singh Commercial fruits (2004) Kalyani Publishers

Course Outcomes:**After completing the course, students will be able to:**

1. Students will understand package of practices for the major crops like mango, banana, guava, lemon, pineapple, coffee, coconut and rub

BAG 406: PRINCIPLES OF SEED TECHNOLOGY

Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (1+2)	Unit Test: 30 Marks
Tutorials: Nil	Practical Marks: 20 Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

1. To study about seeds and its importance in agriculture.
2. To study different classes of seeds
3. To study the seed production of some importance crops, pulses etc
4. To give an overview seed certification.
5. To study seed acts.

Syllabus

Theory

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**. 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.

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. 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. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.

Text and Reference books:

1. Agarwal, R.L. 1991. Seed Technology. Oxford & IBH Publishing Co. Delhi
2. Agarwal, P.K. 1999. Seed Technology. ICAR, New Delhi.
3. Subir Sen and Nabinanda Ghosh. 1999. Seed Science and Technology. Kalyani Publishers.

New Delhi.

4. DhirenraKhare and Mohan S. Bhale.2000. Seed Technology. Scientific Publishers (India), Jodhpur.
5. Maloo,S.R., Intodia, S.K. and Pratap Singh.2008. Beej Pradyogiki. Agrotech Publishing Academy.
6. A.K. Joshi and B.D. Singh.2005.Seed Technology. Kalyani Publishers, New Delhi.
7. Arya, P.S. 2001. Vegetable Breeding and Seed Production. Kalyani Pub., Ludhiana
8. Saxena,R.P.1984. BeezSansadhan. GBPA&T, Pantnagar.
9. Singh, B.D. 2005. Plant Breeding. Kalyani Publishing House, New Delhi.
10. Shekhawat, S. S. and S. Gangopadhyay (eds.) (2013). Quality Fodder Seed Production. Centre for Forage Management, ARS, SKRAU, Bikaner.

Course Outcomes:

After completing the course, students will be able to:

1. To supply the disease free seed in the market to get the environment friendly cultivation of crops.
2. To increase the farm income by producing high yielding disease free quality seed and decrease the cost of cultivation also.
3. Production of hybrid seed of different crops to increase the farm income.
4. Store the pure variety seed to avoid the availability crises of pure variety seed due to adverse environmental conditions.

BAG 407: FARMING SYSTEM & SUSTAINABLE AGRICULTURE

Teaching Scheme Lectures and Practical: 1 hr./ week (1+0) Tutorials: Nil Credits: 1	Examination Scheme Unit test :50 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To study different components of farming systems.
2. To study mechanism and interaction of different components
3. To study the processes for waste recycling
4. To study different techniques and approaches of sustainable agriculture.

Syllabus

Theory

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

Text and Reference books:

1. Panda, S.C.2004. Cropping Systems and Farming Systems, Agrobios (India), Jodhpur.
2. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Sharma, Arun K. 2002. A Handbook of Organic Farming, Agrobios (India) Ltd., Jodhpur
4. Balasubramaniyan, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur.
5. Shukla, Rajeev K. 2004. Sustainable Agriculture, Surbhee Publications, Jaipur
6. Palaniappan, S.P.1985. Cropping Systems in the Tropics: Principles and Management, Wiley Easter Ltd. and TNAU, Coimbatore.
7. Reddy S. R. 2016. Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana.

Course Outcomes:

After completing the course, students will be able to:

1. The student will be able to design and develop farming system models.
2. The will learn efficient management of different farming system components

BAG 408: AGRICULTURAL MARKETING TRADE & PRICES

Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

1. To study market and their different types.
2. To study producer surplus of agriculture commodities.
3. To study product life cycle.
4. To study different types marketing channels.
5. TO study E commerce and E marketing.

Syllabus**Theory**

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

Plotting and study of demand and supply curves and calculation of elasticities. 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; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, Identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. To study their organization and functioning; Application of principles of comparative advantage of international trade.

Text and Reference Books:

1. Acharya, S.S. and Agarwal, N.L., 1994, Agricultural Price Analysis and Price Policy, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Acharya, S.S. and Agarwal, N.L., 2004, Agricultural Marketing in India, Oxford and IBH Publishing Co. New Delhi.
3. G. L. Meena, S. S. Burark, D. C. Pant and Rajesh Sharma, 2017. Fundamentals of Agribusiness Management, Agrotech Publishing Academy, Udaipur, ISBN: 978-818321-418-6. First edition.
4. Kahlon, A.S. and George, M.V., 1985, Agricultural Marketing and Price Policy, Allied Publication Pvt. Ltd., New Delhi.
5. Kohls, Richard L. and Uhl, Joseph N., 1980, Marketing of Agricultural Products, Macmillan Publishing Co., Inc. New York
6. Mamoria, C.B and Joshi, R.L., 1971, Principles and Practice of Marketing in India, Kitabmahal, Allahabad.

Course Outcomes:**After completing the course, students will be able to:**

1. Increase in Farm Income: An efficient marketing system ensures higher levels of income for the farmers by reducing the number of middlemen or by restricting the commission on marketing services and the malpractices adopted by them in the marketing of farm products.
2. Growth of Agro-based Industries: An improved and efficient system of agricultural marketing helps in the growth of agro-based industries and stimulates the overall development process of the economy. Many industries depend on agriculture for the supply of raw materials.
3. Adoption and Spread of New Technology: The marketing system helps the farmers in the adoption of new scientific and technical knowledge. New technology requires higher investment and farmers would invest only if they are assured of market clearance.
4. Addition to National Income: Marketing activities add value to the product thereby increasing the nation's gross national product and net national product.
5. Will learn different production factors and their rationalization

BAG 409: INTRODUCTORY AGRO-METEOROLOGY & CLIMATE CHANGE

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To study earth atmosphere and their different layers.
2. To study about weather and climate.
3. To study different climatic parameters.
4. To crop weather parameters relationship.
5. To study climate change and mitigation strategies.
6. To study climate and its impact on agriculture.

Syllabus**Theory**

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon-mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic 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 wind rose. Measurement, tabulation and analysis of rain. Measurement of open

pan evaporation and evapotranspiration. Computation of PET and AET.

Test and Reference books:

1. Sacheti, A.K. 1985. Agricultural Meteorological Instructional Cum Practical Manual (Ed.) NCERT Publication, New Delhi.
2. Lal, D.S. 2005 Climatology, Sharda Pustak Bhawan, Allahabad..
3. Varshneya, M.C. and Balakrishna, Pillai, 2003. Text book of Agricultural Meteorology. ICAR, New-Delhi.
4. Sahu, D.D., 2007. Agrometeorology and Remote sensing: Principles and Practices ,Agrobios (India) , Jodhpur.
5. Murithy, K, and Radha, V. 1995. Practical Manual on Agricultural Meteorology , Kalyani Publishers, New-Delhi
6. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
7. Balasubramaniyan, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy, Agrobios (India), Jodhpur

Course Outcomes:

After completing the course, students will be able to:

1. Become familiar with atmospheric composition.
2. They will learn about agromet observatory and recording of weather parameters.
3. Will learn strategies to mitigate climate change impacts.
4. Will learn weather forecast and its long term impact on crop production.

ELECTIVE COURSES

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

Examination Scheme (Semester wise)

Credit hours distribution			
S.No	Course Code	Course Title	Credit Hours
1.	BAG001	Agribusiness Management	3(2+1)
2.	BAG002	Agrochemicals	3(2+1)
3.	BAG003	Commercial plant Breeding	3(1+2)
4.	BAG004	Landscaping	3(2+1)
5.	BAG005	Food safety and Standards	3(2+1)
6.	BAG006	Biopesticides & Biofertilizers	3(2+1)
7.	BAG007	Protected Cultivation	3(2+1)
8.	BAG008	Micro Propagation technologies	3(1+2)
9.	BAG009	Hi-Tech Horticulture	3(2+1)
10.	BAG010	Weed Management	3(2+1)
11.	BAG011	System Simulation and Agro-advisory	3(2+1)
12.	BAG012	Agriculture Journalism	3(2+1)
TOTAL			36 (21+15)

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	FM
BAG001	Agribusiness Management	3	2	1	20	30	50	100	300
BAG002	Agrochemicals	3	2	1	20	30	50	100	300
BAG003	Commercial plant Breeding	3	1	2	20	30	50	100	300
BAG004	Landscaping	3	2	1	20	30	50	100	300
BAG005	Food safety and Standards	3	2	1	20	30	50	100	300
BAG006	Biopesticides & Biofertilizers	3	2	1	20	30	50	100	300
BAG007	Protected Cultivation	3	2	1	20	30	50	100	300
BAG008	Micro Propagation technologies	3	1	2	20	30	50	100	300
BAG009	Hi-Tech Horticulture	3	2	1	20	30	50	100	300
BAG010	Weed Management	3	2	1	20	30	50	100	300
BAG011	System Simulation and Agro-advisory	3	2	1	20	30	50	100	300
BAG012	Agriculture Journalism	3	2	1	20	30	50	100	300

C-Credit, L-Lecture, P-Practical, UT-Unit test, ESM: End semester marks, FM-Final marks (TXC)

BAG001- AGRIBUSINESS MANAGEMENT

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks
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Course Objectives:

1. To examine the complexity of managing in a global world.
2. To use agribusiness management thought to develop a better understanding of agriculture.
3. To develop an ability to work with moral and ethical dilemmas and make decisions using critical thinking.
4. To expose students to several models of agribusiness management.

Syllabus

Theory

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

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 added products, Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD, Preparations of projects and Feasibility reports for agribusiness entrepreneur, Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques, Case study of agro-based industries, Trend and growth rate of prices of agricultural commodities, Net present worth technique for selection of viable project, Internal rate of return.

Text and Reference books:

1. G. L. Meena, S. S. Burark, D. C. Pant and Rajesh Sharma, 2017. Fundamentals of Agribusiness Management, Agrotech Publishing Academy, Udaipur, ISBN: 978-81-8321-418-6. First edition.
2. Gittinger, J.P, 1984, Economic Analysis of Agricultural Projects, John Hopkins University Press.
3. Kotler, Philip, 1999, Marketing Management, Prentice Hall of India, New Delhi,
4. L.L. Somani and G. L. Meena, 2017. Agribusiness & Farm Management at a Glance, Vol-2, Basic & Applied Fundamentals, Agrotech Publishing Academy, Udaipur, ISBN: 978-81-8321-429-2. Second edition.
5. Mamoria, C. B., Joshi, R. L. and Mulla, N. I. 2005, Principles and Practices of Marketing in India, Kitab Mahal, Allahabad.
6. Sudha, G.S, 2000, Business Management, RBSA Publishers, Jaipur.
7. Tripathi, P. C. and Reddy, P. N, Principles of Management, Tata McGraw Hill Education Private Limited, New Delhi, 2008.

Course Outcomes:**After completing the course, students will be able to:**

1. Students will be able to effectively evaluate the impact of trade policy, common markets, trading blocks, market instability, commodity problems, trade agreements and environmental regulations on imports and exports in international trade to be able to improve production decision making.

BAG002- AGROCHEMICALS

Teaching Scheme	Examination Schemes
Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To know the chemicals present in different agrochemical products
2. To study the different formulation methods
3. Learn about chemicals composition and formulations.

Syllabus**Theory**

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

Practical

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 of water soluble P_2O_5 and citrate soluble P_2O_5 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.

Text and Reference books:

1. Jaganathan, R. and R. Jayakumar. 2003. Weed Science Principles, Kalyani Publishers, New Delhi.
2. Gupta, O. P. 1998. Modern Weed Management. Agro Botanica Bikaner, India.
3. Rao, V.S. 2000. Principles of Weed science. Oxford & IBH Publishing Co. New Delhi.

Course Outcomes:**After completing the course, students will be able to:**

1. Students will be familiarized about the agrochemical and their classification.
2. Different weed control methods and management through these agrochemicals will be studied.
3. Different chemicals and its formulations for weed management will be understood.

BAG003- COMMERCIAL PLANT BREEDING

Teaching Scheme Lectures and Practical: 3 hr./week (1+2) Tutorials: Nil Credits: 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50
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Course Objectives:

1. To impart knowledge on genetic diversity, inheritance and variation in crops
2. To make the student understand different breeding methods in asexually propagated, self and cross pollinated crops
3. To learn IPR, patenting, Plant Breeders and Farmers Rights

Syllabus**Theory**

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

Text and Reference books:

1. Chopra, V.L. 2000. *Breeding of Field Crops* (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Mandal, AK., P.K. Ganguli and S.P. Banerjee. 1991. *Advances in Plant Breeding*. Vol. I and II. CBS Publishers and Distributors, New Delhi.
3. Manjit S. Kang 2004. *Crop Improvement: Challenges in the Twenty-First Century* (Edt). International Book Distributing Co. Lucknow.

4. Poehlman, J.M. 1987. *Breeding of Field Crops*. AVI Publishing Co.. INC, East Port, Connecticut, USA. 51
5. Ram, H.H. and H.G. Singh. 1994. *Crop Breeding and Genetics*. Kalyani Publishers, New Delhi.
6. Sharma, A.K. 2005. *Breeding Technology of Crop Plants* (Edt.). Yash Publishing House, Bikaner.
7. Ram. H.H. 2005. *Vegetable Breeding — Principles and Practices*. Kalyani Publishers, New Delhi.
8. Agarwal, R.L.1991.*Seed Technology*. Oxford & IBH Publishing Co. Delhi.
9. Dhirenra Khare and Mohan S. Bhale.2000. *Seed Technology*. Scientific Publishers India), Jodhpur.
10. Maloo,S.R., Intodia, S.K. and Pratap Singh.2008. *Beej Pradyogiki*. Agrotech Publishing Academy.
11. A.K. Joshi and B.D. Singh.2005.*Seed Technology*. Kalyani Publishers, New Delhi.
12. Arya, P.S. 2001. *Vegetable Breeding and Seed Production*. Kalyani Pub., Ludhiana
13. Singh, B.D. 2005. *Plant Breeding*. Kalyani Publishing House, New Delhi.
14. Singh, P. 2001.*Essentials of Plant Breeding-Principles and Methods*. Kalyani Publishing House, New Delhi.
15. Shekhawat, S. S. (ed) (2016). *Advances and Current Issues in Agriculture*, VoI. III. Shiksha Prakashan, S. M. S. Highway, Jaipur.

Course Outcomes:

After completing the course, students will be able to:
1. Origin and diversity of different crops, components of inheritance and variations will be understood.
2. Students will be able to apply different breeding techniques for crop improvement
3. Gain knowledge on IPR, patenting, Plant Breeders and Farmers Rights followed.

BAG004- LANDSCAPING

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits : 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50
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Course Objectives:

1. To educate students on production technology of cut flowers, ornamental crops and turf management.
2. To study the Landscape use of trees, shrubs and climbers
3. Exposing the students to different styles of landscape gardening.
4. To know about harvesting and post-harvest handling of flower crops.

Syllabus

Theory

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. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

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 used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, 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 computer software, visit to important gardens/ parks/ institutes.

Text and Reference books:

1. Bose, T. Ornamental Plants and Garden Design in Tropics and subtropics, Vol-2 sets Daya
2. Arora J. S. 2006 Introductory Ornamental Horticulture Kalyani Publishers, Ludhiana
3. Gopaldaswamiengar, K.S. The Complete Gardening in India. The Hosali Press, Bangalore
4. Bose, T.K. Malti, R.G. Dhua, R.S. & Das, P. Floriculture and Landscaping (2004) Nayaprakash
5. Bose, T.K. and Mukherjee, D. Gardening in India (2004) Oxford & IBH Publishers
6. Chadha, K.L. and Chaudhary, B. Ornamental Horticulture in India (1986) ICAR
7. H.S.Grewal and Parminder Singh Landscape designing and ornamental plants (2014)
8. K.V.Peter. Ornamental plants (2009) New India publishing agency

9. R.K. Roy Fundamentals of Garden designing (2013) New India publishing agency
10 Randhawa, G.S. Amitabha Mukhopadhyay Floriculture in India (2004) Allied Publishers Pvt. Ltd., New Delhi
11 Tiwari, A.K. Fundamentals of Ornamental Horticulture and Landscaping Gardening NIPA

Course Outcomes:

After completing the course, students will be able to:

- 1.Familiarized with the production technology of cut flowers, ornamental crops and turf management.
- 2.Landscape use of trees, shrubs and climbers were studied.
- 3.Learnt about the various styles of gardening.
- 4.Got familiarized with the harvesting and post-harvest handling of flower crops.

BAG005- FOOD SAFETY AND STANDARDS

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50
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Course Objectives:

1. To disseminate the knowledge of properties of products, unit operations and packaging involved in dairy and food engineering.
2. To introduce the students to dairy industry, properties and processing of milk, manufacture of dairy products , sanitation and effluent treatment in dairy industry
3. To expose the students to the fundamental knowledge of food, its properties and different methods of food processing

Syllabus**Theory**

Food Safety- Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards- Biological, Chemical, Physical hazards. Management of hazards- Need. Control of parameters. Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM- concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

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.

Text and Reference books:

1. Pandey, R.H. 1997. Postharvest Technology of fruits and vegetables (Principles and practices). Saroj Prakashan, Allahabad.
2. Sudheer, K P. and Indira, V. 2007. Post Harvest Engineering of horticultural crops. New India Publishing House.

Course Outcomes:**After completing the course, students will be able to:**

1. The students will gain knowledge about Dairy and Food process engineering
2. The students will understand the process of manufacturing of dairy products and thermal processing of food.

BAG006- BIOPESTICIDES & BIOFERTILIZERS

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. Teaching students the history of microbes and conventional fertilizer.
2. To study the classification, characteristics features of microbes.
3. Understanding the process and technique of synthesis of biofertilizer and biopeptides
4. To study the impacts on crops and environment

Syllabus**Theory**

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. 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. Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*; Cyanobacterial biofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Practical

Isolation and purification of important biopesticides: *Trichoderma*, *Pseudomonas*, *Bacillus*, *Metarhizium* etc and its production, Identification of important botanicals, Visit to biopesticidelaboratory 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 inoculum production of biofertilizers, Isolation of AM fungi -Wet sieving method and sucrose gradient method, Mass production of AM inoculants.

References:

1. Lakshman, H.C. (2014) Bio-fertilizers and Bio-pesticides. Pointer Publishers
2. Sylvia D.N. 2005; Principles and application of Soil Microbiology. Pearson Publisher.
3. Project Directorate of Biological control. 1994. Technology for mass production of natural enemies. Technical Bulletin-4.

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| 4. Rabindra, R.J., Kennedy, J.S., Sathaiah, N., Rajeshkharan, B. and Srinivasan, M.R. 2001. Microbial control of crop pests. TNAU.
5. Dhaliwal, GS & Koul O. 2007. Biopesticides and pest management. Kalyani Publ., New Delhi |
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Course Outcomes:

After completing the course, students will be able to:
1. Development of biofertilizers and biopesticides
2. Understanding the impacts on soil, crop and environmental health
3. Development of skill to set up biofertilizer and biopesticides units

BAG007- PROTECTED CULTIVATION

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To enable the students to know the basics of protected cultivation.
2. To impart knowledge about the various techniques involved in protected cultivation.
3. To provide technical know-how on secondary agriculture.

Syllabus

Theory

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc. 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 protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging and misting.

References:

1. Brahma Singh, Balraj Singh, NavedSabir and MurtazaHasan, 2014. Advances in Protected Cultivation. New India Publishing Agency, New Delhi.
2. Donell Hunt, 2013. Farm Power and Machinery Management. 10th edition. MedTec Publishers, New Delhi.
3. Jana, B. L., 2008. Precision Farming. AgroTech Publishing Academy Green house: Science and Technology. 2016. Kothari S, S.C. Kaushic and A.N. Mathur. Himanshu Publication, Udaipur.
4. Green House Technology- Application and Practice. Sharma A and V.M. Salokhe. 2006. Agro Tech. publication, Udaipur
5. Principles of Agricultural Engineering, Vol. I. 2012. Michael, A.M. and T. P. Ojha . Jain Brothers, New Delhi.
6. Post Harvest Technology of Cereals, Pulses and Oil Seeds. 1999. Chakravarty, A. Oxford and IBH Pub. New Delhi.
7. Agricultural Process Engineering. 1955. Henderson, S.M. and R.L. Perry. John Willy and Sons, New York.
8. Unit operation of Agriculture Processing. 2004. Shay K.M. and Singh, K.K. Vikas Publication House, New Delhi.
9. K. RadhaManohar and C. Ignathinathane. 2015. Greenhouse Technology and Management.

2nd edition. B. S. Publications.

Course Outcomes:

After completing the course, students will be able to:

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| 1. The students will understand the basic concepts of protected cultivation. |
| 2. The students will design improved protected cultivation measures. |
| 3. The students will analyze cost economics in secondary agriculture. |

BAG008- MICRO PROPAGATION TECHNOLOGIES

Teaching Scheme Lectures and Practical: 3 hr./week (1+2) Tutorials: Nil Credits: 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To impart skill oriented knowledge on media preparation and handling of tools for propagation
2. To teach students on propagation methods
3. To familiarize with the maintenance and after care of propagated plants

Syllabus**Theory**

Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture), Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, 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 for explants, Preparation of stocks and working solution, Preparation of working medium, Culturing of explants: Seeds, shoot tip and single node, Callus induction, Induction of somatic embryos, regeneration of whole plants from different explants, Hardening procedures.

References:

1. Chawala H S (2000). *Introduction to Plant Biotechnology*. Oxford & IBH, New Delhi
2. Gupta, P. K. (2008). *Elements of Biotechnology*. Rastogi Publications, Meerut
3. Ray V. Herren (2005). *Introduction to Biotechnology (An Agricultural revolution)*
4. Shekhawat, M. S. (2011) *Plant Biotechnology, In vitro Principles, Techniques and Applications*. MJP Publishers, Chennai
5. Mascarenhas, A. F. (2008). *Hand Book of Plant Tissue Culture*. ICAR, New Delhi
6. Singh BD. 2005. *Biotechnology, Expanding Horizons*. Kalyani Publishers, New Delhi.

Course Outcomes:**After completing the course, students will be able to:**

1. Students benefited with hands-on training in media preparation handling of tools for propagation
2. Students learnt about mother plant selection and propagation techniques.
3. Students familiarized with the maintenance and after care of propagated plants

BAG009- HI-TECH. HORTICULTURE

Teaching Scheme	Examination Schemes
Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50 Marks

Course Objectives:

1. To teach fundamentals of horticulture and horticultural practices
2. To impart knowledge on different types of plant propagation and also structures used in farms
3. To expose the students to different horticulture vegetables, fruits, species, aromatic and medicinal crops.

Syllabus

Theory

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods, Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding, 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.

References:

- 1 Hartman, HT and Kester, DE (1986). Plant propagation principles and practices. Prentice Hall of India Pvt. Ltd., Bombay
1. Gill, SS. Bal, JS and Sadhu, AS (1985). Raising Fruit Nursery, Kalyani Publishers, New Delhi.
2. Chadha, K.L. Handbook of Horticulture (2002) ICAR, New Delhi
3. Chadda K.L Advanced in Horticulture (2009) Malhotra Publishing House, New Delhi
4. Anonymous 2003. *Proc. All India Seminar on Potential and Prospects for Protective Cultivation*. Organised by Institute of Engineers, Ahmednagar. Dec.12-13, 2003.
5. Chandra, S & Som, V. 2000. *Cultivating Vegetables in Green House*. *Indian Horticulture* 45: 17- 18.
6. Prasad S & Kumar U. 2005. *Greenhouse Management for Horticultural Crops*. 2nd Ed. Agrobios.
7. Tiwari GN. 2003. *Green House Technology for Controlled Environment*. Narosa Publ. House.

Course Outcomes:

After completing the course, students will be able to:

1. Fundamentals of horticulture and classification of crops learned.
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2. Different types of plant propagation techniques and structures used in the farm studied.

3. Gained practical knowledge in plant propagation and pest and disease control

BAG010- WEED MANAGEMENT

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To identify the weed species, present in different agro ecosystems
2. To study the different weed control methods
3. Learn about herbicides and its formulations and integrated weed management

Syllabus**Theory**

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. 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. 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 agrochemicals 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.

Reference:

1. Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T. 2003. Weed Management , ICAR, New-Delhi.
2. Gupta, O.P. 2015. Weed Management: Principles and Practices (2nd Ed.), Agribios (India), Jodhpur.
3. Gupta, O.P. 2016. Modern Weed Management , Agribios (India), Jodhpur
4. Das, T.K. 2008. Weed Science : Basics and Applications , Jain Brothers, New-Delhi.
5. Rao, V.S. 2000. Principals of Weed Science (2nd edition), Oxford and IBH Publishing Co., New Delhi.

Course Outcomes:**After completing the course, students will be able to:**

1. Will develop capability to identify the weeds of different crops.
2. Learn different methods to control weeds
3. Understanding different modules of IWM for different crops
4. Getting knowledge on different herbicides and their formulation

BAG011- SYSTEM SIMULATION AND AGROADVISORY

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. To learn the simulation modelling using large number of variables
2. To predict yield and crop response under different environment and input management
3. To rationalize inputs and practices for higher efficiencies
4. To develop decision support systems

Syllabus**Theory**

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams. Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

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 & 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 agro-advisory.

Course Outcomes:

After completing the course, students will be able to:
1. Development of skills for appropriation of inputs and farm operations.
2. Understanding climatic impacts and tailoring management options.
3. Understanding strategies and practices for mitigation of climate change

BAG012- AGRICULTURAL JOURNALISM

Teaching Scheme Lectures and Practical: 3 hr./week (2+1) Tutorials: Nil Credits: 3	Examination Schemes Unit test: 30 Marks Practical marks : 20 Marks End Semester Exam:50 Marks
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Course Objectives:

1. The course is intended to orient the students with the concept of extension education and its importance in Agriculture development.
2. To expose the students with various rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis
3. To make the students learn about the new innovations being brought into the Agricultural Extension in India.
4. To learn about the new trends in agriculture extension

Syllabus

Theory

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. 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. 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. 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 outting.

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.

References:

1. Ray, G. L. and Mondal, S. 2005. Journalism including communication, Farm and Rural Journalism, Public Relations, Kalyani Publication, Ludhiana.
2. Bhaskaran et. Al. 2008. Farm Journalism and media management Agrotech Publishing Company.
3. Narayanaswamy V R. 1979. Strengthen your writing. Orient Longman, New Delhi.
4. Kamat, M.G., Writing for farm families.
5. Indu Grover. Mass media and Communication.
6. Arvind Kumar (1999). The Electronic Media. Anmol Publications, New Delhi.

7. Bhatt, S.C. (1993) Broadcast Journalism. Basic Principles Har Anand Publications, Delhi
8. Bhatnagar, R. (2001). Print Media and Broadcast Journalism. Indian Publisher Distributors, Delhi
9. Katyal, V.P (2007). Fundamentals of Media Ethics. Cyber Tech Publishers, New Delhi.
10. Subin Mohan et al (2010) Handbook on farm Journalism. Pulari Publishers, Karnal.
11. A.K. Singh, 2014, Agricultural Extension and Farm Journalism. Agrobios, Jodhpur

Course Outcomes:

After completing the course, students will be able to:

1.Students learned the concepts of agricultural extension and rural development programs.

2.New innovations in the area of agricultural extension in India understood

3. Gained practical knowledge on watershed development and self-help groups

4.New trends in agriculture extension learned



Evaluation Scheme & Syllabus

Of

Bachelor of (Hons.) Agriculture (III Year)

(w.e.f. Academic Session 2018-19)

Department of Agriculture

INVERTIS UNIVERSITY - INVERTIS VILLAGE

Bareilly-Lucknow NH-24, Bareilly

Examination Scheme (Fifth Semester)

V Semester (Credit hours distribution)			
S.No	Course Code	Course Title	Credit Hours
1.	BAG501	Principles of Integrated Pest and Disease Management	3(2+1)
2.	BAG502	Manures, Fertilizers and Soil Fertility Management	3(2+1)
3.	BAG503	Diseases of Field and Horticultural Crops and their Management -I	3(2+1)
4.	BAG504	Pests of Crops and Stored Grain and their Management	3 (2+1)
5.	BAG505	Entrepreneurship Development and Business Communication	2 (1+1)
6.	BAG506	Crop Improvement-I (<i>Kharif Crops</i>)	2 (1+1)
7.	BAG507	Geoinformatics and Nano-technology and Precision Farming	2(1+1)
8.	BAG508	Intellectual Property Rights	1(1+0)
9.	BAG591	Practical Crop Production – I (<i>Kharif crops</i>)	2(0+2)
10.		Elective Course*	3 credits
TOTAL			21(12+9)+3

21(12+9)+3:21 lectures per week, (12+9) :indicate 12 Lecture and nine practical and 3: credit hours of elective course

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	FM
BAG501	Principles of Integrated Pest and Disease Management	3	2	1	20	30	50	100	300
BAG502	Manures, Fertilizers and Soil Fertility Management	3	2	1	20	30	50	100	300
BAG503	Diseases of Field and Horticultural Crops and their Management -I	3	2	1	20	30	50	100	300
BAG504	Pests of Crops and Stored Grain and their Management	3	2	1	20	30	50	100	300
BAG505	Entrepreneurship Development and Business Communication	2	1	1	20	30	50	100	200
BAG506	Crop Improvement-I (<i>Kharif Crops</i>)	2	1	1	20	30	50	100	200
BAG507	Geoinformatics and Nano-technology and Precision Farming	2	1	1	20	30	50	100	200
BAG508	Intellectual Property Rights	1	1	0	0	50	50	100	100
BAG591	Practical Crop Production – I (<i>Kharif crops</i>)	2	0	2	100	0	0	100	200
	Elective Course*	3			20	30	50	100	300
Total									2400

C-Credit, L-Lecture, P-Practical, , UT-Unit test, ESM: End semester marks, FM-Final marks (TXC), Elective Course*: To be selected from the list

BAG 501: PRINCIPLES OF INTEGRATED PEST AND DISEASE MANAGEMENT**Teaching Scheme**

Lectures and Practical: 3 hr./ week (2+1)

Tutorials: Nil

Credits: 3

Examination Scheme

Unit Test: 30Marks

Practical marks: 20Marks

End Semester Exam:50Marks

Course Objectives:

1. To know about Integrated Pest Management and their history, importance and principles.
2. To know different methods of detection and diagnosis of insect pest and disease.
3. To describe different tools of IPM to control pest and disease.
4. To give knowledge of conventional pesticide for the insect pest and disease management.
5. To explain the importance of Survey surveillance and forecasting of insect pest and disease.
6. To give an overview of some case histories of important IPM programmes.

Syllabus**Theory**

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. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. 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. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

Practical

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*, *Pseudomonas*, *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.

Text and Reference books:

1. David and Ramamurthy. 2016. Elements of Economic Entomology. Brillion Publishing; 8th Edition edition (2016).
2. A.S. Atwal & G.S. Dhaliwal, 2002. Agricultural Pests of South Asia and their Management. Kalyani Publishers (2015)
3. G.S. Dhaliwal & Ramesh Arora . Integrated Pest Management. Kalyani Publisher.

Course Outcomes:

After completing the course, students will be able to:
1. Understand Economic importance of insect pest,disease and pest risk analysis.
2. Understand different tools of IPM like cultural and mechanical practices etc. to manage insect pest and diseases.
3. Understand Political , Social and Legal implication of about Integrated Pest Management.
4. Understand maximum ideas regarding the control measures and management of diseases and pest.
5. Understand detail account of pesticide and their uses in the crops.
6. Understand why judicious use of chemical control is necessary.
7. Understand the importance of Survey, Surveillance and Forecasting of Insect Pest and Disease.

BAG502: MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT**Teaching Scheme**

Lectures and Practical: 3 hr./ week (2+1)

Tutorials: Nil

Credits: 3

Examination Scheme

Unit Test: 30Marks

Practical marks: 20Marks

End Semester Exam:50Marks

Course Objectives:

1. To study organic manures and their types.
2. To study fertilizer their classification and types.
3. To study essential plant nutrients their deficiency and toxicity symptoms in plants and soil.
4. To estimate different types of nutrients and their quantity in soil.

Syllabus**Theory**

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.

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

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

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.

Text and reference books:

1. Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi.
2. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi
3. Rai, M.M. (2002) Principal of Soil Science, Mac Millan India Ltd, New Delhi
4. Mehra R.K. (2004) Text book of Soil Science, ICAR New Delhi
5. ISSS (2002) Fundamental of Soil Science Div. of Soil Science, IARI, New Delhi
6. Yawalkar, K.S. and Agarwal. J.P. (1992). Manure and fertilizers. Agriculture- Horticulture Publishing House, Nagpur

Course Outcomes:

After completing the course, students will be able to:

1.To impart knowledge of fertilizers and manures as sources of plant nutrients and apprise about the integrated approach of plant nutrition and sustainability of soil fertility.

2.Know the requirements of manures and fertilizers for various crops and their proper time of application.
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3.Know how the soil fertility and productivity can be maintained for better crop production.
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BAG 503: DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT -I

Teaching Scheme	Examination Scheme
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

- 1.To know about different symptoms, etiology and disease cycle of major disease of important crops.
- 2.To explain the different methods to manage the disease of some major Field crops and Horticultural crops
- 3.To know the different plant pathogen causes disease.
- 4.To describe the methods of management of plant disease.

Syllabus

Theory

Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

Practical

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

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

Text and Reference books:

- 1.H. S. Chaube, V. S. Pundhir.2005.Crop diseases and their management. PHI Learning Pvt. Ltd.
- 2.R.S.Singh. Plant disease. Medtech; 10 edition.2017

Course Outcomes:

After completing the course, students will be able to:

- 1.Understand economic importance of plant disease
- 2.Identify symptoms of major diseases in crops
- 3.Understand the mechanism of disease development

BAG 504: PESTS OF CROPS AND STORED GRAIN AND THEIR MANAGEMENT**Teaching Scheme**

Lectures and Practical: 3 hr./ week (2+1)

Tutorials: Nil

Credits: 3

Examination Scheme

Unit Test: 30Marks

Practical marks: 20Marks

End Semester Exam:50Marks

Course Objectives:

1. To know about nature and type of damage by different arthropods pest.
2. To know about detailed information, biology and bionomics, nature of damage, and management of major pests.
3. To know about pest of stored grains.
4. To explain about role of different factor in deterioration of stored grain.
5. To know about different storage structure and methods of grain storage.

Syllabus**Theory**

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 major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

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. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food. Visit to nearest FCI godowns.

Text and Reference books:

1. Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.
2. David and Ramamurthy. 2016. Elements of Economic Entomology. Brillion Publishing; 8th Edition edition (2016).

Course Outcomes:**After completing the course, students will be able to:**

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| 1. Understand nature of damage of different arthropods pest |
| 2. Understand an insect management programme for stored grains. |
| 3. Understand risk of chemical residue on the grains. |
| 4. Understand the right procedures and methods for prevent grain damage. |
| 5. Identify many insect pests, rodents, birds and microorganisms of stored grains. |

BAG505: ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS COMMUNICATION

Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	Examination Scheme Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks
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Course Objectives:

1. To study entrepreneurship and its importance in socio economic development of the nation.
2. To study the key resources required to develop an existing business such as ideas and finance, launch a new venture, or initiate a business enterprise.
3. To study project formulation and report preparation.

Syllabus

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agri enterprises, 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, 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, visit to entrepreneurship development institute and entrepreneurs.

Text and Reference books:

1. Harold Koontz & Heinz Weihrich. 2004. Essentials of Management: An International Perspective, 2nd Ed. Tata Mc-Graw Hill Publishing Pvt Ltd.
2. Chole, R. R. Kapse, P. S. and Deshmukh, P. R. 2012. Entrepreneurship Development and Communication Skills scientific Publisher (India), Jodhpur.
3. Bhaskaran, S. 2014. Entrepreneurship Development and Management. Aman Publishing House, Meerut.
4. Mancuso, J. 1974. The Entrepreneurs Handbook (Vol. 192), Artech House, Inc., USA.
5. Karthikeyan, C. et al. 2008. A Text Book of Agricultural Extension Management. Atlantic Publishers, New Delhi.
6. Natrajan, K. and Ganeshan, K.P. 2012. Principles of Management. Himalaya Publishing House, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Identify the elements of success of entrepreneurial ventures
2. Understand the effectiveness of different entrepreneurial strategies
3. Can Interpret their own business plan
4. Will be able to analyze the business environment in order to identify business opportunities.

BAG506: CROP IMPROVEMENT-I (KHARIF CROPS)

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To study origin and distribution of crop species.
2. To study the plant genetic resources and its utilization in improvement of crop plants.
3. To study about breeding objectives of different crops.
4. To study hybrid seed production technology of *Kharif* crops.

Syllabus**Theory**

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops; 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. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz. Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, 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 decent 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; Visit to seed production plots. Visit to AICRP plots of different field crops.

Text and Reference books:

1. Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Chaddha. K.L. and Rajendra Gupta. 1995. Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.
3. Mandal, A. K., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding. Vol. I and II. CBS Publishers and Distributors, New Delhi.
4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.
5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co. INC, East Port, Connecticut, USA.
6. Ram, H.H. and H.G. Singh. 1994. Crop Breeding and Genetics. Kalyani Publishers, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the importance of wild relative to produce new varieties of *kharif* crop.
2. Understand gene preservation method for further use to improve *kharif* crops.
3. Understand identification of resistance gene relate to *kharif* crop with high yieldpotential against Pest and pathogen and utilization genes.
4. Learnslearn to apply breeding method to improve *kharif* crops.

BAG507: GEOINFORMATICS AND NANO-TECHNOLOGY AND PRECISION FARMING

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To study the precision farming which may be helpful to increase production of crop.
2. To study about GPS and GIS system.
3. To study nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Syllabus

Theory

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

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 nanoparticles in agriculture. Projects formulation and execution related to precision farming.

Test and Reference books:

1. Krishna, K.K. 2013. Precision Farming: Soil Fertility and Productivity Aspects. Apple Academic Press
2. Srivastava, G.S. 2014. An Introduction to Geoinformatics. McGrew Hill Education (India) Pvt. Ltd. , New Delhi
3. Gupta, R.K. and Subhash Chander. 2008. Principles of Geoinformatics. Jain Brothers, New Delhi.
4. Choudhary, S. 2011. Applied Nanotechnology in Agriculture. Arise Publishers & Distributors
5. Sekhon, B.S. 2014. Nanotechnology in agri-food production: an overview. Nanotechnology, Science and Applications 7:31-532.

Course Outcomes:**After completing the course, students will be able to:**

1. More effective use of inputs results in greater crop yield and/or quality, without polluting the environment.
2. Creating awareness amongst farmers about consequences of applying imbalanced doses of farm inputs like irrigation, fertilizers, insecticides and pesticides.
3. Precision agriculture can address both economic and environmental issues that surrounded production agriculture today.

BAG508: INTELLECTUAL PROPERTY RIGHTS

Teaching Scheme	Examination Scheme
Lectures and Practical: 1 hr./ week (1+0) Tutorials: Nil Credits: 1	Unit test:50 Marks End Semester Exam:50 Marks

Course Objectives:

1. To study the concept of IPR.
2. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
3. To study how to get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.

Syllabus**Theory**

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. Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

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. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Text and Reference books:

1. Intellectual Property Rights and the Law, Dr. G.B. Reddy, Gogia Law Agency.
2. Law relating to Intellectual Property, Dr. B.L. Wadehra, Universal Law Publishing Co.
3. IPR P. Narayanan
4. Law of Intellectual Property, Dr.S.R. Myneni, Asian Law House

Course Outcomes:**After completing the course, students will be able to:**

1. Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.
2. Skill to pursue the professional programs in Company Secretary ship, Law, Business, Agriculture, International Affairs, Public Administration and Other fields.
3. They get awareness of acquiring the patent and copyright for their innovative works.
4. They also get the knowledge of plagiarism in their innovations which can be questioned legally.

BAG591: PRACTICAL CROP PRODUCTION – I (KHARIF CROPS)**Teaching Scheme**

Lectures and Practical: 2 hr./ week (0+2)

Tutorials: Nil

Credits: 2

Examination Scheme

Practical: 100 Marks

Course Objectives:

1. To study management and production of field crops at commercial level.
2. To study computation of benefit cost ratio.
3. To study different marketing channels.
4. To study storage and marketing of their produce.

Syllabus**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.

Text and Reference books:

1. Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 2008. Manures and Fertilizers (10th edition), Agri-Horticultural Publishing House, Nagpur.
2. Balasubramaniyan, P. and Palaniappan, S.P. 2016. Principles and Practices of Agronomy Agrobios (India), Jodhpur.
3. Reddy, S. R., 2016. Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana.
4. Singh, S.S. and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

Course Outcomes:**After completing the course, students will be able to:**

1. Profitable based farming system can we adopted with the help of course content
2. Helps to adopt diversified farming system according to available farming situation.
3. In the course study students will be acquainted with the knowledge of profitable crop production technology.
4. Earning while learning

Examination Scheme (Sixth Semester)

VI Semester (Credit hours distribution)			
S.No	Course Code	Course Title	Credit Hours
1.	BAG601	Rainfed Agriculture & Watershed Management	2 (1+1)
2.	BAG602	Protected Cultivation and Secondary Agriculture	2(1+1)
3.	BAG603	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)
4.	BAG604	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)
5.	BAG605	Management of Beneficial Insects	2 (1+1)
6.	BAG606	Crop Improvement-II (<i>Rabi crops</i>)	2(1+1)
7.	BAG607	Principles of Organic Farming	2(1+1)
8.	BAG608	Farm Management, Production & Resource Economics	2(1+1)
9.	BAG609	Principles of Food Science and Nutrition	2(2+0)
10.		Elective Course*	3 credits
11.	BAG691	Practical Crop Production –II (<i>Rabi crops</i>)	2(0+2)
TOTAL			21(11+10)+3
21(11+10)+3:21 lectures per week, (11+10) :indicate 11 Lecture and 10 practical+3-elective course			

Evaluation Scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	FM
BAG 601	Rainfed Agriculture & Watershed Management	2	1	1	20	30	50	100	200
BAG 602	Protected Cultivation and Secondary Agriculture	2	1	1	20	30	50	100	200
BAG 603	Diseases of Field and Horticultural Crops and their Management-II	3	2	1	20	30	50	100	300
BAG 604	Post-harvest Management and Value Addition of Fruits and Vegetables	2	1	1	20	30	50	100	200
BAG 605	Management of Beneficial Insects	2	1	1	20	30	50	100	200
BAG 606	Crop Improvement-II (<i>Rabi crops</i>)	2	1	1	20	30	50	100	200
BAG 607	Principles of Organic Farming	2	1	1	20	30	50	100	200
BAG 608	Farm Management, Production & Resource Economics	2	1	1	20	30	50	100	200
BAG 609	Principles of Food Science and Nutrition	2	2	0	0	50	50	100	200
BAG691	Practical Crop Production –II (<i>Rabi crops</i>)	2	0	2	100	0	0	100	200
	Elective Course*	3			20	30	50	100	300
Total									2400
C-Credit, L-Lecture, P-Practical, , UT-Unit test, ESM: End semester marks, FM-Final marks (TxC), Elective Course*: To be selected from the list									

BAG601:RAINFED AGRICULTURE & WATERSHED MANAGEMENT

Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	Examination Scheme Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks
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Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of different types of rainfed systems of country
3. Basic knowledge of rain fed agriculture and water shed management practices.

Syllabus

Theory

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India ; 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; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, 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.

Text and Reference books:

1. Jayanthi, C. and Kalpana, R. 2016. Dryland Agriculture, Kalyani Publishers, Ludhiana.
2. Reddy, S.R. and Reddy, G. Prabhakara. 2015. Dryland Agriculture, Kalyani Publishers, Ludhiana.
3. Murthy, J. V. S. 1994. Watershed Management, Wiley Eastern Limited. New Age International Limited, New Delhi.
4. Dhruva Narayan, V.V. Singh, P.P., Bhardwaj, S.P., U. Sharma, Sikha, A.K., Vital, K.P.R. and Das, S.K. 1987. Watershed Management for Drought Mitigation, ICAR, New Delhi.
5. Singh, R.P., Sharma, S., Padmnabhan, N.V. , Das, S.K. and Mishra, P.K. 1990. A Field Manual on Watershed Management, ICAR (CRIDA), Hyderabad.
6. Singh, P.K. 2000. Watershed Management (Design & Practices), e-media Publication, Udaipur, India.

Course Outcomes:

After completing the course, students will be able to:

1. Conservation of soil by adopting latest soil conservation techniques will help in obtaining higher production of Rain-fed crops
2. Student can able to understand about rainfed agriculture and its introduction, problem and prospects in India
3. Student can able to understand objective, principles and component of watershed management.

BAG 602: PROTECTED CULTIVATION AND SECONDARY AGRICULTURE**Teaching Scheme**

Lectures and Practical: 2 hr./ week (1+1)
Tutorials: Nil
Credits: 2

Examination Scheme

Unit Test: 30Marks
Practical marks: 20Marks
End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of different types of biomolecules.
3. To explain the structure and function of plant constituents and components.
4. To describe all biological phenomena at molecular level.

Syllabus**Theory**

Green house technology: Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipment's, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air greenhouse heating systems, green house drying. Cost estimation and economic analysis.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. 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 greenhouses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of greenhouse equipment's. Visit to various Post Harvest Laboratories. 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.

Text and Reference books:

1. Green House Technology- Application and Practice. Sharma A and V.M.Salokhe. 2006. Agro Tech. publication, Udaipur
2. Principles of Agricultural Engineering, Vol. I. 2012. Michael, A.M. and T. P. Ojha . Jain Brothers, New Delhi.
3. Post Harvest Technology of Cereals, Pulses and Oil Seeds.1999. Chakravarty, A. Oxford and IBH Pub. New Delhi.
4. Agricultural Process Engineering. 1955. Henderson, S.M. and R.L. Perry. John Willy and Sons, New York.
5. Unit operation of Agriculture Processing. 2004. Shay K.M. and Singh, K.K. Vikas Publication House, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Conservation of soil by adopting latest soil conservation techniques will help in obtaining higher production of Rain-fed crops

2. Student can able to understand about rainfed agriculture and its introduction, problem and prospects in India

3. Student can able to understand objective, principles and component of watershed management.

**BAG 603: DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR
MANAGEMENT-II**

Teaching Scheme

Lectures and Practical: 3 hr./ week (2+1)

Tutorials: Nil

Credits: 3

Examination Scheme

Unit Test: 30Marks

Practical marks: 20Marks

End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject.
2. To give an overview of different types of disease caused in field and horticulture crops.
3. To symptoms and management of different diseases.

Syllabus

Theory

Symptoms, etiology, disease cycle and management of following diseases:

Field Crops:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and PokkahBoeng; Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

Horticultural Crops:

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

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

Practical

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

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

Text and Reference books:

1. Cook, A. A. 1981. Diseases of tropical and sub-tropical field fiber and oil plants. Mac Millan Publishing Co. New York.
2. Gupta V K and Paul, Y S 2008. IInd ed. Diseases of field crops. Kalyani Publishing Co. ND.
3. Mehrotra R S and Aggarwal A. 2012. 12th ed. Plant Pathology, Tata McGraw-Hill Publishing Co Ltd. ND.
4. Mishra A , Bohra A and Mishra , A. 2005. Plant Pathology. Agrobios. Jodhpur (India). 119
5. Rangaswamy,G and Mahadevan, A . 2012. 4th ed. Diseases of crop plants in India. Prentice hall of India Pvt Ltd, New Delhi.
6. Singh R S .2007. 8th ed. Plant Diseases. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi
7. Gupta ,V. K. 2014. Diseases of Fruit Crops. Kalyani Publishers

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| 8. Chaube H.S. Crop Diseases and Their Management. PHI
9. Singh R S .2007. Plant Diseases.(9th Ed.) Oxford and IBH Publishing Co.Pvt .Ltd .ND
10. Singh , R.P. 2013. Plant Pathology. Kalyani Publishers |
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Course Outcomes:

After completing the course, students will be able to:

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| 1. Student will know the common pathogens of different diseases. |
| 2. By knowing means of dispersal of these diseases suitable management methods can be applied. |
| 3 Eco-friendly and economically suitable management practices may be adopted. |

BAG 604: POST-HARVEST MANAGEMENT AND VALUE ADDITION OF FRUITS AND VEGETABLES

Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	Examination Scheme Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks
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Course Objectives:

1. To give knowledge of chemical composition of fruits and vegetables, their pre and post harvest changes.
2. To give knowledge about storage of fruits and vegetables and cause of their post harvest losses, its preservation by value addition.
3. Gives knowledge of methods to prevent the post harvest losses.
4. To impart knowledge on technology for food preservation techniques.

Syllabus

Theory

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; Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning -- Concepts and Standards, packaging of products.

Practical

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, osmotically dried products, fruit bar and candy and tomato products, canned products. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/ industry.

Text and Reference books:

1. Battacharjee, S. K. and De, L. C Post Harvest Technology of Flowers and Ornamentals Plants (2005) Pointer Publisher
- 2 Jacob John, P A Handbook on Post Harvest management of Fruits and vegetables (2008) Daya Publishing House, Delhi
- 3 Manoranjan, K and Sangita, S. Food Preservation & Processing (1996) Kalyani Publishers
- 4 Mitra, S. K. Post Harvest Physiology and Storage of Tropical and Sub-tropical Fruits (1997) CAB International
5. Morris, T. N. Principles of Fruit Preservation (2006) Biotech Books, Delhi
- 6 Saraswathy, S. et. al. Post harvest Management of Horticultural Crops (2008) Agribios
- 7 Srivastava, R. P. & Sanjeev Kumar Fruits and vegetable Preservation – Principles and Practice (2002) International Book Distributing Co., Lucknow

Course Outcomes:

After completing the course, students will be able to:
1. Understand the different causes of post harvest losses.
2. Gives knowledge about storage chain of fruits and vegetables and their field handling.
3. Imparts knowledge of food preservation methods to prevent post harvest losses.
4. Understand the various food standards and quality control for food preservation.

BAG 605: MANAGEMENT OF BENEFICIAL INSECTS

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To know about importance of beneficial insects e.g. Honeybee, silk worm, Lac insect etc.
2. To know about morphology and physiology of beneficial Insect
3. To explain about Environmental factors affecting insect life cycle and their infestation.
4. To give knowledge of different categories of pest and their recent methods of control.
5. To give detail account of concept, scope, practices and limitation of Integrated Pest Management.

Syllabus

Theory

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. Role of pollinators in cross pollinated plants.

Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.

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.

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

Practical

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.

Text and Reference books:

1. DeBach, P. 1974. Biological control by Natural enemies. Cambridge University Press.
2. Dhaliwal GS & Arora R. 2001. Integrated Pest Management: Concepts and approaches. Kalyani Publ., New Delhi.
3. Dhaliwal, GS & Koul O. 2007. Biopesticides and Pest Management. Kalyani Publ., New Delhi.
4. Gautam, R.D. Biological Pest Suppression, WestvillPublishing Co., New Delhi.
5. Manfred Mackaur, Laster E.Ehler and Jens Roland. 1990. Critical Issues in Biological

control- Intercept Ltd. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin -4.

Course Outcomes:

After completing the course, students will be able to:

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|---|
| 1. Understand the importance of beneficial insects. |
| 2. Understand about the commercial methods of rearing of Honey bee, Silk worm and Lac insect. |
| 3. Understand about the pest and disease in beekeeping, Sericulture and Lac culture. |
| 4. Recognize major pest and predators used in biological control. |
| 5. Familiar about the important species of pollinators, weeds killers and scavengers. |

BAG 606: CROP IMPROVEMENT-II (RABI CROPS)

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To learn basic principles and fundamentals genetics and plant breeding.
2. To learn different approaches of breeding viz., conventional and modern and advance techniques.
3. To study the wild relatives of different crops.
4. To study the hybrid seed production technology of *rabi* crops

Syllabus**Theory**

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters; 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 of *rabi* crops. Ideotype concept and climate resilient crop varieties for future.

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 decent 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; Visit to seed production plots; Visit to AICRP plots of different field crops. 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.

Text and Reference books:

1. Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Chaddha. K.L. and Rajendra Gupta. 1995. Advances in Horticulture Vol. II Medicinal and Aromatic Plants. Malhotra Publishing House, New Delhi.
3. Mandal, A.K., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding Vol. I and II. CBS Publishers and Distributors, New Delhi.
4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.
5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co.. INC, East Port, Connecticut, USA.
6. Ram, H.H. and H.G. Singh. 1994. Crop Breeding and Genetics. Kalyani Publishers, New Delhi.

Course Outcomes:

After completing the course, students will be able to:
1.Students learn importance of wild relative to produce new varieties of Rabi crop.
2 learns Gene preservation method for further use to improve Rabi crops.
3. Learner learns to apply breeding method to improve Rabi crops

BAG 607: PRINCIPLES OF ORGANIC FARMING

Teaching Scheme	Examination Scheme
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To study about the importance of organic farming and its scope in India.
2. To study the initiatives taken by the government for the promotion of organic farming.
3. To study different organic nutrient resource used in organic farming.
4. To study operational structure of NPOP.
5. To study the certification process of organic farming

Syllabus

Theory

Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture; 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; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

Visit of 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.

Text and Reference books:

1. Dhama, A.K. 2014. Organic Farming for Sustainable Agriculture (2nd edition), Agrobios (India), Jodhpur.
2. Sharma, Arun K. 2013. A Handbook of Organic Farming, Agrobios (India), Jodhpur
3. Palaniappan, S.P. and Anandurai, K. 1999. Organic Farming – Theory and Practice. Scientific Pub. Jodhpur
4. Thapa, U and Tripathy, P. 2006. Organic Farming in India, Problems and prospects, Agritech, Publishing Academy, Udaipur.

Course Outcomes:

After completing the course, students will be able to:

1. Understanding the concept of Organic farming.
2. Learning the production techniques for organic crop production
3. Preparation of manures and natural pesticides.
4. Understand the process of organic certification.

BAG 608: FARM MANAGEMENT, PRODUCTION & RESOURCE ECONOMICS**Teaching Scheme**

Lectures and Practical: 2 hr./ week (1+1)
Tutorials: Nil
Credits: 2

Examination Scheme

Unit Test: 30Marks
Practical marks: 20Marks
End Semester Exam:50Marks

Course Objectives:

1. To learn farm and its different components
2. To learn the skills of action farm management.
3. To study different types of farm recorded and their importance.
4. To study the farm economics and ways to improve it.

Syllabus**Theory**

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 product product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical

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. Collection and analysis of data on various resources in India.

Text and Reference books:

1. Dhondyal, S.P., "Farm Management – An Economic Analysis", Aman Publishing House, Madhu Market, Meerut (U.P.).
2. Bhavani Devi, P. Raghu Ram, S. SubbaReddy, T.V. Neelakanta Sastry, 2009, Agricultural

economics, Oxford and IBH Co. Pvt. Ltd., , New Delhi.

3. Johl, S.S. and T.R. Kapur, 1989, Fundamentals of Farm Business Management, Kalyani Publishers, Ludhiyana.

4. Kerr, John M., et al., 1997, Natural Resource Economics: Theory and Applications in India, Oxford & IBH, New Delhi.

5. Raju, V. T. and D. V. S. Rao, 2002, "Economics of Farm Production and Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Upscaling agricultural technologies.

2. Managing farm in commercial mode.

3. Knowledge on agriculture input and industries.

4. Improving farm economics.

BAG 609: PRINCIPLES OF FOOD SCIENCE AND NUTRITION

Teaching Scheme Lectures and Practical: 2 hr./ week (2+0) Tutorials: Nil Credits: 2	Examination Scheme Unit test: 50 Marks End Semester Exam:50 Marks
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Course Objectives:

- 1.To give knowledge of various basic concept of food science, food composition its chemistry.
- 2.To give knowledge about basic food microbiology involved in food spoilage or production both.
- 3.Gives knowledge of methods of food processing and preservation,nutrition and nutritional disorders
- 4.To impart knowledge on energy metabolism, balanced diet menu planning also.

Syllabus**Theory**

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions); 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.); 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.

Text and Reference books:

- 1.Srilakshmi, B. (2010). Text Book of Food Science. New age international (P) limited, publisher, New Delhi
- 2 Sehgal, S. and Raghuvanshi, R.S. (2007). Text Book of Community Nutrition, ICAR Publication
- 3 Khaddar V., (1999). Text Book of Food. Storage and Preservation. Kalyani Publishers, New Delhi.
- 4 Srilakshmi, B. (2010). Text Book of Nutrition Science. New age international (P) limited, publisher, New Delhi
- 5 Swaminathan. M. (1993). Advanced Textbook on Food and Nutrition. Volume I, Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore, p. 576.

Course Outcomes**After completing the course, students will be able to:**

1. Understand the basics of food science, food composition its chemistry.
2. Gives knowledge about basic food microbiology involved in food spoilage or production both.
- 4.Imparts knowledge of methods of food processing and preservation ,nutrition and nutritional disorders
4. Understand the energy metabolism, balanced diet menu planning also.

BAG 691: PRACTICAL CROP PRODUCTION –II (RABI CROPS)**Teaching Scheme**

Lectures and Practical: 2 hr./ week (0+2)
Tutorials: Nil
Credits: 2

Examination Scheme

Practical:100 marks

Course Objectives:

- 1.To learn commercial cultivation of crops
- 2.To learn hands on tool for handling different inputs and operations.
- 3.To work in group mode.

Syllabus**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.

Text and Reference books:

1. Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 2008. Manures and Fertilizers (10th edition), Agri-Horticultural Publishing House, Nagpur.
2. Balasubramanian, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur.
3. Reddy, S. R. 2016. Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana.
4. Singh, S.S. and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

Course Outcomes**After completing the course, students will be able to:**

1. Earning while learning
2. Skill to tackle crop raising on commercial scale.
3. Knowledge of seed to seed.



Evaluation Scheme & Syllabus

Of

Bachelor of (Hons.) Agriculture (VI Year)

(w.e.f. Academic Session 2018-19)

Department of Agriculture

INVERTIS UNIVERSITY - INVERTIS VILLAGE

Bareilly-Lucknow NH-24, Bareilly

BAG751	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA)	
	Activities	No. of weeks
	General Orientation & On campus training by different faculties	1
	Village attachment	8
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5
	Plant clinic	2
	Agro-Industrial Attachment	3
	Project Report Preparation, Presentation and Evaluation	1
	Total weeks for RAWE & AIA	20

Course Objectives:

1. To make the students familiar with a package of practices of the farmers.
2. To make them familiar with the kind of Agri-based industries.
3. To orient them with national and international advances in agriculture
4. To develop skill for identification of crop pest and diseases and their management.

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

Educational tour will be conducted in break between IV & V Semester or VI & VII Semester

RAWE component I

Village Attachment Training Programme

S.No.	Activity	Duration
	Orientation and Survey of Village	1 week
	Agronomical Interventions	1 week
	Plant Protection Interventions	1 week
	Soil Improvement Interventions (Soil sampling and testing)	1 week
	Fruit and Vegetable production interventions	1 WeeK
	Food Processing and Storage interventions	1 week
	Animal Production Interventions	1 week
	Extension and Transfer of Technology activities	1 week

RAWE Component –II

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

Activities and Tasks during Agro-Industrial Attachment Programme

Acquaintance with industry and staff

Study of structure, functioning, objective and mandates of the industry

Study of various processing units and hands-on trainings under supervision of industry staff

Ethics of industry

Employment generated by the industry

Contribution of the industry promoting environment

Learning business network including outlets of the industry

Skill development in all crucial tasks of the industry

Documentation of the activities and task performed by the students

Performance evaluation, appraisal and ranking of students

Course Outcomes:

After completing the course, students will be able to:

1. Students will acquire knowledge on agricultural business.

2. They will get updated knowledge on local practices and problems being faced by the stack holders.

3. They can develop plant clinic.

4. Will have basic knowledge of agri-based industries.

8th Semester

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

Credit distribution		
Subject Code	Title of the module (elp PROGRAMME)	Credits
BAG851	Production Technology for Bioagents and Biofertilizer	0+10
BAG852	Seed Production and Technology	0+10
BAG853	Mushroom Cultivation Technology	0+10
BAG854	Soil, Plant, Water and Seed Testing	0+10
BAG855	Commercial Beekeeping	0+10
BAG856	Poultry Production Technology	0+10
BAG857	Commercial Horticulture	0+10
BAG858	Floriculture and Landscaping	0+10
BAG859	Food Processing	0+10
BAG860	Agriculture Waste Management	0+10
BAG861	Organic Production Technology	0+10
BAG862	Commercial Sericulture	0+10

Evaluation scheme									
Course code	Course title	C	L	P	PM	UT	ESM	T	FM
BAG851	Production Technology for Bioagents and Biofertilizer	10	0	10	100	0	0	100	1000
BAG852	Seed Production and Technology	10	0	10	100	0	0	100	1000
BAG853	Mushroom Cultivation Technology	10	0	10	100	0	0	100	1000
BAG854	Soil, Plant, Water and Seed Testing	10	0	10	100	0	0	100	1000
BAG855	Commercial Beekeeping	10	0	10	100	0	0	100	1000
BAG856	Poultry Production Technology	10	0	10	100	0	0	100	1000
BAG857	Commercial Horticulture	10	0	10	100	0	0	100	1000
BAG858	Floriculture and Landscaping	10	0	10	100	0	0	100	1000
BAG859	Food Processing	10	0	10	100	0	0	100	1000
BAG860	Agriculture Waste Management	10	0	10	100	0	0	100	1000
BAG861	Organic Production Technology	10	0	10	100	0	0	100	1000
BAG862	Commercial Sericulture	10	0	10	100	0	0	100	1000
Total									2000
C-Credit, L-Lecture, P-Practical, UT-Unit test, ESM: End semester marks, FM-Final marks (TxC)									

Evaluation of Experiential Learning Programme/ HOT

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