SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR (M.P.)

SYLLABUS

For

Bachelor of Science in Agriculture

As per, ICAR Norms 5th Dean Committee

Course Code: BSCAG

Department of Agriculture Science
Faculty of Agriculture Science

Duration of Course : 4 Year

Examination Mode : Semester

Swami Vivekanand University, Sironja Sagar (M.P.)

2016-2020

Discipline wise Courses

Discipline wise title		Credit (Hrs.)
Agronomy		
1	Fundamentals of Agronomy	4(3+1)
2	Introductory Agro-meteorology & Climate Change	2(1+1)
3	Crop Production Technology – I (Kharif crops)	2(1+1)
4	Crop production Technology – II (Rabi crops)	2(1+1)
5	Farming System & Sustainable Agriculture	1(1+0)
6	Practical Crop Production – I (Kharif crops)	2(0+2)
7	Practical Crop production – II (Rabi crops)	2(0+2)
8	Principles of Organic Farming	2(0+2)
9	Geo informatics and Nano technology and Precision Farming	2(1+1)
10	Rainfed Agriculture & Watershed Management	2(1+1)
Genetics & Plant Breeding		
1	Fundamentals of Genetics	3(2+1)
2	Principles of Seed Technology	3(1+2)
3	Fundamentals of Plant Breeding	3(2+1)
4	Crop Improvement – I (Kharif crops)	2(1+1)
5	Crop Improcement –II (Rabi crops)	2(1+1)
Soil Science & Agricultural Chemistry		
1	Fundamentals of Soil Science	3(2+1)
2	Manures Fertilizers and soil Fertility Management	3(2+1)
3	Problematic soils and their Management	2(2+0)
Entomology		
1	Fundamentals of Entomology	4(3+1)
2	Pests of Crops, Stored Grain and their Management	3(2+1)
3	Management of Beneficial Insects	2(1+1)
Agricultural Economics		
1	Fundamentals of Agricultural Economics	2(1+0)
2	Agricultural Finance and Co-Operation	3(2+1)
3	Agricultural Marketing Trade & Prices	3(2+1)
4	Farm Management, Production & Resource Economics	2(1+1)
Agricultural Engineering		
1	Soil and Water Conservation Engineering	2(1+1)
2	Farm Machinery and Power	2(1+1)
3	Renewable Energy and Green Technology	2(1+1)
4	Protected Cultivation and Secondary Agriculture	2(1+1)
Plant Pathology		
1	Fundamentals of Plant Pathology	4(3+1)
2	Diseases of Field and Horticultural Crops and their Management –I	3(2+1)
3	Diseases of Field and Horticultural Crops and their Management –II	3(2+1)
4	Principles of Integrated Pest and Disease Management	3(2+1)
Horticulture		
1	Fundamentals of Horticulture	2(1+1)
2	Production Technology for Fruit and Plantation Crops	2(1+1)
3	Production Technology for Vegetables and Spices	2(1+1)

4	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
5	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
	Food Science	
1	Principles of Food Science & Nutrition	2(2+0)
	Agricultural Extension	
1	Fundamentals of Agricultural Extension Education	3(2+1)
2	Rural Sociology & Educational Psychology	2(2+0)
3	Entrepreneurship Development and Business Communication	2(1+1)
4	Communication Skills and Personality Development	2(1+1)
Biochemistry/Physiology/Microbiology/Environmental Sciences		
1	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
2	Fundamentals of Crop Physiology	2(1+1)
3	Agricultural Microbiology	2(1+1)
4	Environmental Studies & Disaster Management	3(2+1)

5	Introduction to Forestry	2(1+1)
Statistics, Computer Application and I.P.R.		
1	Statistical Methods	2(1+1)
2	Agri-Informatics	2(1+1)
3	Intellectual Property Rights	1(0+1)
Animal Production		
1	Livestock and poultry Management	4(3+1)
Language		
1	Comprehension & Communication Skills in English (Gradial course)	2(1+1)
Remedial Courses		
1	Agricultural Heritage	1(1+0)
2	Introductory Biology	2(1+1)
3	Elementary Mathematics	2(2+0)
Non-Gradial Courses		
1	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
2	Human Values & Ethics	1(1+0)
3	Educational Tour	2(0+2)

Semester wise distribution of courses

1	Fundamentals of Horticulture	2(1+1)
2	Fundamentals of plant Biochemistry and Biotechnology	3(2+1)
3	Fundamentals of Soil Science	3(2+1)
4	Introduction to Forestry	2(1+1)
5	Comprehension & Communication Skills in English	2(1+1)
6	Fundamentals of Agronomy	4(3+1)
7	Introductory Biology* / Elementary Mathematics*	2(1+1) 2(2+0)
8	Agricultural Heritage*	1(1+0)*
9	Rural Sociology & Educational Psychology	2(2+0)
10	Human Values & Ethics (Non Gradial)	1(1+0)**
11	NSS/NCC/Physical Education & Yoga Practices**	2(0+2)**
	TOTAL Remedial Course:**NC: Non-gradial courses	**18+04* 03*+03***

II Semester		
1	Fundamentals of Genetics	3(2+1)
2	Agricultural Microbiology	2(1+1)
3	Soil and Water Conservation Engineering	2(1+1)
4	Fundamentals of Crop Physiology	2(1+1)
5	Fundamentals of Agricultural Economics	2(2+0)
6	Fundamentals of plant Pathology	4(3+1)
7	Fundamentals of Entomology	4(3+1)
8	Fundamentals of Agricultural Extension Education	3(2+1)
9	Communication Skills and Personality Development	2(1+1)
	Total	**24(16+8)**

III Semester		
1	Crop Production Technology- I (Kharif Crops)	2(1+1)
2	Fundamentals of Plant Breeding	3(2+1)
3	Agricultural Finance and Cooperation	3(2+1)
4	Agri-Informatics	2(1+1)
5	Farm Machinery and Power	2(1+1)
6	Production Technology for Vegetables and Spices	2(1+1)
7	Environmental Studies and disaster Management	3(2+1)
8	Statistical Methods	2(1+1)
9	Livestock and Poultry Management	4(3+1)
	Total	**23(14+9)**

IV Semester		
1	Crop Production Technology – II (Rabi Crops)	2(1+1)
2	Production Technology for Ornamental Crops, MAP and Land Croping	2(1+1)
3	Renewable Energy and Green Technology	2(1+1)
4	Problematic Soils and their Management	2(2+0)
5	Production Technology For Fruit and Plantation Crops	2(1+1)
6	Principles of Seed Technology	3(1+2)
7	Farming System & Sustainable Agriculture	1(1+0)
8	Agricultural Marketing Trade & Prices	3(2+1)
9	Introductory Agro-meteorology & Climate Change	2(1+1)
10	Elective Course	3 credit
	Total	**19(11+8)+3Cr. Hours**

V Semester		
1	Principles of Integrated Pest and Diseased Management	3(2+1)
2	Manures, Fertilizers and Soil Fertility Management	3(2+1)
3	Pests of Crops and Stored Grain and their Management	3(2+1)
4	Diseases of Field and Horticultural Crops and their Management - I	3(2+1)
5	Crop Improvement – I (Kharif Crops)	2(1+1)
6	Entrepreneurship Development and Business Communication	2(1+1)
7	Geoin Formatics and Nano-techulogy and Precision Farmig	2(1+1)
8	Prctical Crop Production – I (Kharif Crops)	2(0+2)
9	Intellectual Property Rights	1(1+0)
10	Elective Course	3 credit
	Total	**21(12+09) +3 Cr. Hours**

Evaluation of Experiential learning Programme/HOT

1	Parameters	Max. Marks
2	Project Planning and Writing	10
3	Presentation	10
4	Regularity	10
5	Monthly Assessment	10

VI Semester		
1	Rainfed Agriculture & Watershed Management	2(1+1)
2	Protected Cultivation and Secondary Agriculture	2(1+1)
3	Diseases of Field and Horticultural Crops and their Management – II	3(2+1)
4	Post-harvest management and value addition of Fruits and Vegetables	2(1+1)
5	Management of Beneficial Insects	2(1+1)
6	Crop Improvement – II (Rabi Crops)	2(1+1)
7	Practical Crop Production – II (Rabi Crops)	2(0+2)
8	Principles of Organic Farming	2(1+1)
9	Farm Management, Production & Resource Economics	2(1+1)
10	Principles of Food Science and Nutrition	2(0+2)
11	Elective Course	3 credit
	Total	**21(11+10) + 3**

VII Semester			
Sr.No.	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA)		
	Activities	No. of Weeks	Credit Hours
1	General Orientation & On Campus Training by Different Faculties	1	14
2	Village Attachment	8	
3	Unit Attachment in Univ./College. KVK/Research Station Attachment	5	
4	Plant Clinic	2	02
5	Agro-Industrial Attachment	3	04
6	Project Report Preparation, Presentation and Evaluation	1	
7	Total Weeks for RAWE & AIA	20	20

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

RAWE Component – I

Village Attachment Training Programme

Sr.No.	Activity	Duration
1	Prientation snd Survey of Village	1 Week
2	Agronomical interventions	1 Week
3	Plant Protection Interventions	1 Week
4	Soil Improvement Interventions (Soil Sampling and testing)	1 Week
5	Fruit and Vegetable Production Interventions	1 Week
6	Food Processing and Storage Interventions	1 Week
7	Animal Production Interventions	1 Week
8	Extension and Transfer of Technology Activates	1 Week

RAWE Component – II

Village Attachment Training Programme

Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 Weeks.

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

Activities and Tasks during Agro-Industrial Attachment Programme .

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

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 tin the VIII Semester.

Sr. No	Title of the module	Credits
1	Production Technology for Bio agents and Bio fertilizer	0+10
2	Seed Production and Technology	0+10
3	Mushroom Cultivation Technology	0+10
4	Soil, Plant. Water and Seed Testing	0+10
5	Commercial Beekeeping	0+10
6	Poultry Production Technology	0+10
7	Commercial Horticulture	0+10
8	Floriculture and Landscaping	0+10
9	Food Processing	0+10
10	Agriculture Waste Management	0+10
11	Organic Production Technology	0+10
12	Commercial Sericulture	0+10

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

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**

Discipline wise summary of credit hours

Group		**Credits**
1	Agronomy	21(10+11)
2	Genetics & Plant Breeding	13(7+6)
3	Soil Science & Agricultural Chemistry	8(6+2)
4	Entomology	9(6+3)
5	Agricultural Economics	10(7+3)
6	Agricultural Engineering	8(4+4)
7	Plant Pathology	13(9+4)
8	Horticulture	10(5+5)
9	Food Science	2(2+0)
10	Agricultural Extension	9(6+3)
11	Biochemistry / Physiology / Microbiology / Environmental Sciences	12(7+5)

ELP	
Grand Total	**143/144+20+20=183/184**
New course	**24+5(Remedial) + 1(NC)**

	Statistics, Computer Application & I.P.R	5(3+2)
	Animal Production	4(3+1)
	English	2(1+1)
	Remedial Courses	03 (Bio/Math) 04 (Agriculture)
	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
	Human Values & Ethics	1(1+0)
	Educational Tour	2(0+2)
	Total	126+3 (for Bio/Math) / 04 (Agri.) + 5 NC 126+3/4+5=134/135 (for Bio/Math/Agri.) +9 credits elective
	RAWE	20+20

NEW COURSES

Sr. No.	Course Title	Credit Hours
1	Geoinformatics, Nanotechnligy & Precision Farming	2(1+1)
2	Rainfed Agriculture & Watershed Management	2(1+1)
3	Problematic Soils & their Management	2(2+0)
4	Renewable Energy & Green Technology	2(1+1)
5	Management of Beneficial Insects	2(1+1)
6	Fundamentals of Horticulture	2(1+1)
7	Introduction to Forestry	2(1+1)
8	Agri- Informatics	2(1+1)
9	Intellectual Property Rights	1(1+0)
10	Principles of Food Science & Technology	2(2+0)
11	Communication Skills & Personality Development	2(1+1)
12	Principles of Integrated Pest & Diseases Management	3(2+1)

13	Agricultural Heritage	1(1+0)*
14	Introductory Biology	2(1+1)*
15	Elementary mathematics	2(2+0)*
16	Human Values & Ethics (NG)	1(1+0)**

*Remedial Courses **Non-Gradial Course

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

Sr. No.	Courses	Credit Hours
1	Agribusiness Management	3(2+1)
2	Agrochemicals	3(2+1)
3	Commercial Plant Breeding	3(2+1)
4	Landscaping	3(2+1)
5	Food Safety & Standards	3(2+1)
6	Bio pesticides & Bio fertilizers	3(2+1)
7	Protected Cultivation	3(2+1)
8	Micro Propagation Technologies	3(2+1)
9	Hi-tech Horticulture	3(2+1)
10	Weed Management	3(2+1)
11	System Simulation & Agro – advisory	3(2+1)
12	Agricultural Journalism	3(2+1)

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Semester wise distribution of courses

I Semester		
1	Fundamentals of Horticulture	2(1+1)
2	Fundamentals of Plant Biochemistry & Biotechnology	3(2+1)
3	Fundamental of Soil Science	3(2+1)
4	Introduction to Forestry	2(1+1)
5	Comprehension & Communication Skills in English	2(1+1)
6	Fundamentals of Agronomy	4(3+1)
7	Introductory Biology*/Elementary Mathematics*	2(1+1) / 2(2+0)*
8	Agricultural Heritage*	1(1+0)*
9	Rural Sociology & Educational Psychology	2(2+0)
10	Human Values & Ethics (Non Gradial)	1(1+0)**
11	NSS/NCC/Physical Education & Yoga Practices**	2(0+2)**
	TOTAL *R: Remedial Course: ** Non-Gradial Courses	18+04* / 03*+03**

I SMESTER

Course Title : Fundamentals of Horticulture 2(1+1)

Theory

UNIT -I

Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops;

UNIT -II

Plant propagation-methods and propagating structures; principles of orchard establishment;

UNIT -III

Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators;

UNIT -IV

Fertilization and parthenocarpy; kitchen gardening; garden types and parts; lawn making; medicinal and aromatic plants;

UNIT -V

Species and condiments; use of plant bio-regulators in horticulture. Irrigation & fertilizers application-method and quantity.

Practical

1. Identification of garden tools.
2. Identification of horticultural crops.
3. Preparation of seed bed/nursery bed.
4. Practice of sexual and asexual methods of propagation Including micro propagation
5. Layout and planting of orchard
6. Preparation of potting mixture
7. Fertilizer application in different crops.
8. Visits to commercial nurseries/orchard.

References

1. Jitendra singh 2011 Basic Horticulture Kalyani Publications New Delhi
2. Prasad and kumar 2014 Princples of Horticulture 2nd Edn.Agrobios [india]
3. Kumar, N , 1990 Introduction to Horticulture Rajya lakshmi Publication nagarcoil Tamilnadu

Course Title : Fundamentals of Plant Biochemistry and Biotechnology **3(2+1)**

Theory

UNIT -I

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.

UNIT -II

Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions 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.

UNIT -III

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

UNIT -IV

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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;

UNIT -V

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

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

References

1. A Text book of plant Pkysiology Bio-chemistry and Bio-technology By Dr. S.K. Varma & Dr. Mohit Varma, S Chand Publication
2. Plant Bio-Chemistry By U.K. Satynarayna Kalyani Publication
3. tho jlk;u MkW yky flag fujadkjh dq'ky izdk'ku

Course Title : Fundamentals of Soil Science 3(2+1)

Theory

UNIT -I

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;

UNIT -II

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;

UNIT -III

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

UNIT -IV

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;

UNIT -V

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

1. Study of soil profile in field.
2. Study of soil sampling tools, collection of representative soil sample, its processing and storage.
3. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity.
4. Determination of soil texture by feel and Bouyoucos Methods.
5. Studies of capillary rise phenomenon of water in soil column and water movement in soil.
6. Determination of soil pH and electrical conductivity.
7. Determination of cation exchange capacity of soil.
8. Study of soil map. Determination of soil colour.
9. Demonstration of heat transfer in soil.
10. Estimation of organic matter content of soil

References

1. Indian Society of Soil Science , 2002 Fundamental of Soil Science , IARI New Delhi
2. Sehgal J.A,2005 Text book of Pedology Concepts and Applications Kalyani Publication New Delhi
3. Dilip Kumar Das 2015 . Introductory Soil Science Kalyani Publication Ludhiana

Course Title : Introduction to Forestry 2(1+1)

Theory

UNIT -I

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;

UNIT -II

Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification.

UNIT -III

Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement;

UNIT -IV

Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.

UNIT -V

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

Practical

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

References

1. Beazley , M. 1981 . the international book of forest . London
2. Champion & Sedh . 1968 . forest types of india
3. Grebner , D.L, Bettinger, P. & Siry , J.P. 2012 Introduction forest & Natural Resources . Academic Prees . 508 P.[Google eBook]

Course Title : Comprehension and Communication Skills in English **2(1+1)**

Theory

UNIT -I

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.

UNIT -II

Exercises to help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

UNIT -III

Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration.

UNIT -IV

Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.

UNIT -V

The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

Practical

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

References

1. English Language and Indian Culture – Tribhuwan Nath Shukla
2. English Conversation Practice – Grant Taylor
3. A Course in Phonetics and Spoken English – J. Sethi and P.V. Dhamija
4. Objective English – Hari Mohan Prasad
5. High School English Grammar – Wren and Martinin

Course Title : Fundamentals of Agronomy 4(3+1)

Theory

UNIT -I

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry

UNIT -II

Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil plant water relationship,

UNIT -III

Crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging.

UNIT -IV

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,

UNIT -V

Plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

Practical

1. Identification of crops, seeds, fertilizers, pesticides and tillage implements,
2. Identification of weeds in crops,
3. Methods of herbicide and fertilizer application,
4. Study of yield contributing characters and yield estimation,
5. Seed germination and viability test,
6. Numerical exercises on fertilizer requirement,
7. plant population, herbicides and water requirement,
8. Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill,
9. Study of soil moisture measuring devices,
10. Measurement of field capacity, bulk density and infiltration rate,
11. Measurement of irrigation water
12. Study of agro-climatic zones of India

References

1. Reddy yellamanda T & Shankar Reddy G H .1995 Principles of Agronomy Kalyani Publishers Ludhiana
2. Rao V S. 1992 Principles of Weed Science Oxford and IBH publishing Co. Ltd. New Dehli

Course Title : Introductory Biology **2(1+1)**

Theory

UNIT - I
Introduction to the living world, diversity and characteristics of life

UNIT - II
Origin of life, Evolution and Eugenics.

UNIT - III
Binomial nomenclature and classification Cell and cell division.

UNIT - IV
Morphology of flowing plants. Seed and seed germination.

UNIT - V
Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

Practical

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

Course Title : Elementary Mathematics **2(2+0)**

Theory

UNIT -I

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,

UNIT -II

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 $x^2 + y^2 = a^2$.

UNIT -III

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.

UNIT -IV

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).

UNIT -V

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**.**

Reference -

- नूतन गणित – आर.बी.त्रिपाठी
- नवबोध गणित – मुकुल साव एवं डॉ. एम.एस.गुप्ता कैलाश पुस्तक सदन हमीदिया मार्ग भोपाल

Course Title : Agriculture Heritage (New Course) **1(1+0)**

Theory

UNIT -I

Introduction of Indian agricultural heritage, status of farmers in society; advice by sages to kings on their duties towards farmers, soil management in ancient, medieval & pre-modern India and its relevance in modern day

UNIT -II

Sustainable agriculture, heritage of crop & water management, plant growth and development & plant protection through vrikshayurveda and traditional knowledge.

UNIT -III

Heritage of medicinal plants and their relevance today, seed health in ancient & medieval history and its relevance to present day agriculture,

UNIT -IV

Description of Indian civilization and agriculture by travelers from China, Europe and United States,

UNIT -V

Our journey in agriculture, green revolution and its impact and concerns, vision for the future.

References

1. A History of Agriculture in India - M.S.Randhawa, Vol. IV (1947-1981), ICAR, New Delhi.
2. Principles of Agronomy - S.R. Reddy, Kalyani Publication, New Delhi.
3. Food and Environment Security - A continuing challenge, keynote address during Second International Agronomy Congress on Balancing Food and Environmental Security, held at New Delhi, Nov. 26-20, 2002 - Punjab Singh (2002).
4. Agricultural Economy - S. Sankaran, S. Chand and Company Publication
5. The Role of women in Indian Agriculture in the globalize era
6. Krishi Siksha, Anusandhan Aur Prasar Ke Bhadate Kadam, Khete 55(8) : 9-12. – Katyal, J.C. and Bhatia, J.S. (2002)

Course Title : Rural Sociology & Educational Psychology **2(2+0)**

Theory

UNIT -I

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Rural society,

UNIT -II

Social Groups, Social Stratification,

UNIT -III

Culture concept, Social Institution, Social Change & Development.

UNIT -IV

Educational psychology: Meaning & its importance in agriculture extension.

UNIT -V

Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

References

1. Introductory Rural Sociology – Chitambar, J.B., Wiley Eastern Private Limited, New Delhi
2. Education and communication for development – Dahama O.P. and Bhatnagar, O.P., Oxford and IBH Publishing Co. New Delhi
3. Rural Sociology in India – Desai, A.R., Popular Prakashan, Bombay
4. Educational Psychology – Jitendra Mohan, Wiley Eastern Limited, New Delhi
5. Educational Psychology – Rai, B.C., Prakashan Kendra, Lucknow

Course Title : Course title: Human Value and Ethics **1(1+0)**

Theory

UNIT -I

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

UNIT -II

Vision of Life. Principles and Philosophy. Self Exploration. Self Awareness.

UNIT -III

Self Satisfaction. Decision Making.

UNIT -IV

Motivation. Sensitivity. Success. Selfless Service. Case Study of Ethical Lives.

UNIT -V

Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

Reference –

- मानवीय मूल्य और पेशेवर नैतिकता - Sanjeev kumar Bhalla & Rupa Bhalla

  सत्या प्रका ाान नई दिल्ली

- A Text Book on - Professional Ethics & Human Values By – R.S. Naagarazan

  New age International Publisher .

Course Title : NSS/NCC/Physical Education & Yoga Practices 2(0+2)

Theory

Course aims at evoking social consciousness among students through various activities viz., working together, constructive and creative social work, to be skilful 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.

Following activities are to be taken up under the NSS course:

- Introduction and basic components of NSS: Orientation
- NSS programmes and activities
- Understanding youth
- Community mobilisation
- Social harmony and national integration
- Volunteerism and shramdan
- Citizenship, constitution and human rights
- Family and society
- Importance and role of youth leadership
- Life competencies
- Youth development programmes
- Health, hygiene and sanitation
- Youth health, lifestyle, HIV AIDS and first aid
- Youth and yoga
- Vocational skill development
- Issues related environment
- Disaster management
- Entrepreneurship development
- Formulation of production oriented project
- Documentation and data reporting
- Resource mobilization
- Additional life skills
- Activities directed by the Central and State Government

All the activities related to the National Service Scheme course is distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one credit load. The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than five regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two year. Different activities will include orientation lectures and practical works.Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

References

1. Cadet Hand Book (Army Wing) – Major R.C. Mishra
2. Cadet Hand Book (Army Wing) – Directorate General, NCC, Ministry of Defence, R.K. Puram, New Delhi.

Course Title : **National Service Scheme I**

Introduction and basic components of NSS:

2(0+2)

Orientation: History, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health

NSS programmes and activities

Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary

Understanding youth

Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change

Community mobilisation

Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership

Social harmony and national integration

Indian history and culture, role of youth in nation building, conflict resolution and peace-building

Volunteerism and shramdan

Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism

Citizenship, constitution and human rights

Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information

Family and society

Concept of family, community (PRIs and other community based organisations) and society

Course Title : Physical Education and Yoga Practices 2(0+2)

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 anThrow Ball).

References

1.	Foundation of Physical Education	–	C.A. Bucher and D.A. Wuest
2.	Introduction to Physical Education, Fitness and Sports	–	Davyal
3.	Applied Anatomy and Biomechanics in sports	–	John Bloom field *et al*.
4.	Methods of Physical Education	–	Kamlesh and Sangral
5.	Science of sports training	–	Hardayal Singh
6.	Application of measurement to physical education	–	H. Harrigon Clark and David H. Clark
7.	भाारीरिक ि ाक्षा के सिद्धांत	–	कमलेश
8.	भाारीरिक ि ाक्षा एवं क्रीडा मार्गदर्शिका	–	डा. व्ही.एस. सेंगर

II Semester		
1	Fundamentals of Genetics	3(2+1)
2	Agricultural Microbiology	2(1+1)
3	Soil & Water Conservation	2(1+1)
4	Fundamentals of Crop Physiology	2(1+1)
5	Fundamentals of Agricultural Economics	2(2+0)
6	Fundamentals of plant Pathology	4(3+1)
7	Fundamentals of Entomology	4(3+1)
8	Fundamentals of Agricultural Extension Education	3(2+1)
9	Communication Skills & Personality Development	2(1+1)
	Total	24(16+8)

II SEMESTER

Course Title : Fundamentals of Genetics **3(2+1)**

Theory

UNIT-I

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity.

UNIT-II

Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes

UNIT-III

Chromosomal theory of inheritance- cell cycle and cell
division- mitosis and meiosis. Probability and Chi-square. Dominance relationships, Epistatic interactions with example.

UNIT-IV

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.

UNIT-V

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

1. Study of microscope.
2. Study of cell structure.
3. Mitosis and Meiosis cell division.
4. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross
5. Experiments on epistatic interactions including test cross and back cross,
6. Practice on mitotic and meiotic cell division,
7. Experiments on probability and Chi-square test.
8. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data).
9. Study on sex linked inheritance in Drosophila.
10. Study of models on DNA and RNA structures.

References

1.	Fundamentals of Genetics	–	B.D. Singh, Kalyani Publisher
2.	Elements of Genetics	–	Phundan Singh, Kalyani Publisher
3.	Genetics	–	M.W. Strickberger
4.	Principles of Genetics	–	Snoids & Simonds (4th edition) John Willy Publication, New York
5.	Manual of Practical genetics	–	Singh, Chouhan and Katiyar, Kalyani Publisher
6.	Cytogenetical practices	–	Choubey and Bhardwaj, Kalyani Publisher
7.	Genetic	–	R.K. Gupta

Course Title : Agricultural Microbiology **2(1+1)**

Theory

UNIT-I

Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure,
chemoautotrophy, photo autotrophy, growth.

UNIT-II

Bacterial genetics: Genetic recombination- transformation, conjugation and transduction, plasmids, transposon.

UNIT-III

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.

UNIT-IV

Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.

UNIT-V

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

Practical

1. Introduction to microbiology laboratory and its equipments; Microscope- parts,
2. principles of microscopy, resolving power and numerical aperture.
3. Methods of sterilization. Nutritional media and their preparations.
4. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.
5. Methods of isolation and purification of microbial cultures.
6. Isolation of Rhizobium from legume root nodule.
7. Isolation of Azotobacter from soil.
8. Isolation of Azospirillum from roots.
9. Isolation of BGA.
10. Staining and microscopic examination of microbes.

References

1. Agricultural Microbiology	–	Rangaswami and Bhagyaraj
2. Soil Microbiology	–	N.S. Subbarao
3. Agricultural Microbiology	–	N. Mukherjee and T. Ghosh
4. Biofertilizers	–	L.L. Somani, S.C. Bhandari, S.N. Saxena
5. Introduction to Soil Microbiology	–	M. Alexender
6. An Introduction to Microbiology	–	P. Tauro, K.K. Kapoor and K.S. Yad

Course Title : Introductory Soil and Water Conservation Engineering **2(1+1)**

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping.

UNIT-IV

Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques.

UNIT-V

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

Practical

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

References

1. Principles of Agricultural Engineering Vol. II – Dr. A.M. Michael and Dr. T.P. Ojha
2. Irrigation – Theory and Practice – Dr. A.M. Michael
3. Surveying and Leveling – B.C. Punamia

Course Title : Fundamentals of Crop Physiology **2(1+1)**

Theory

UNIT-I

Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis;

UNIT-II

Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms;

UNIT-III

Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain;

UNIT-IV

Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses,

UNIT-V

Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Practical

1. Study of plant cells,
2. structure and distribution of stomata, imbibitions, osmosis, plasmolysis,
3. measurement of root pressure, rate of transpiration,
4. Separation of photosynthetic pigments through paper chromatography,
5. photosynthesis,
6. respiration,
7. tissue test for mineral nutrients,
8. estimation of relative water content,
9. Measurement of photosynthetic CO_2 assimilation by Infra Red Gas Analyser (IRGA).

References

1. Plant Physiology - R.M. Devlin and F.S. Witham (1986)
2. Text Book of Plant Physiology - C.P. Malik and A.K. Shrivastava
3. Introductory Plant Physiology - G. Ray Noggle and George, T. Fritz (1994)
4. Crop Physiology - U.S. Gupta
5. Plant Physiology - Frank, B. Salisbury & Cleon W. Ross (1995)
6. Test Book of Plant Physiology - S. Mukherjee and A.K. Ghosh
7. Practical Plant Physiology - O.P. Sharma
8. Plant Physiology - C.P. Malik
9. Plant Physiology - S.C. Dutta
10. Plant Physiology - H.S. Shrivastava
11. Plant Physiology - R.G.S. Bid Well (1979)
12. An introduction to crop physiology - Milthorpe, F.L. and Moorley, J.
13. Physiology of Crop Plants - Gardner, T.P., Pearce, R.B. & Mitchell, R.L.
14. Principles of Post Harvest Seed Physiology and Technology - Maiti, R.K., N.C. Sarkar and V.P. Singh
15. Techniques in Seed Science and Technolog - P.K. Agrawal and M. Dadlani

Course Title : Fundamentals of Agricultural Economics 2 (2+0)

Theory

UNIT-I

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.

UNIT-II

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, 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.

UNIT-III

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: Cost concepts, short run and long run cost curves.

UNIT-IV

Supply: Stock v/s supply, law of supply, 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.

UNIT-V

Population: Importance, Malthusian and Optimum population theories, natural and socio-economic 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, 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.

References

1. Elements of Economic Theory – K.K. Dewett and J.P. Verma
2. Indian Economy – S.K. Mishra and V.K. Puri, Himalayan Publication Pvt. Ltd., New Delhi
3. Fundamentals of Agricultural Economics – K.N. Sandhu & Amarjeet Singh, Himalayan Publication Pvt.Ltd., New Delhi.

Course Title : Fundamentals of Plant Pathology 4(3+1)

Theoy

UNIT-I

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.

UNIT-II

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,

UNIT-III

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).

UNIT-IV

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.

UNIT-V

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

1. Acquaintance with various laboratory equipments and microscopy.
2. Collection and preservation of disease specimen.
3. Preparation of media, isolation and Koch's postulates.
4. General study of different structures of fungi.
5. Study of symptoms of various plant diseases.
6. Study of representative fungal genera.
7. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses.
8. Study of phanerogamic plant parasites.
9. Study of morphological features and identification of plant parasitic nematodes.
10. Sampling and extraction of nematodes from soil and plant material,
11. preparation of nematode mounting.
12. Study of fungicides and their formulations.
13. Methods of pesticide application and their safe use.
14. Calculation of fungicide sprays concentration

References

1. Introduction to Principles of Plant Pathology - R.S. Singh
2. Plant Pathology - E.N. Agrios
3. Plant Pathology - R.S. Mehrotra
4. A text book of modern Plant Pathology - Bilgramie and Dubey
5. Essentials of Plant Pathology - V.N Pathak
6. Introductory Plant Pathology - M.N. Kamath
7. Plant Diseases - P.D. Sharma
8. Fungicides in Plant Disease Control - Y.L. Nene and P.N. Thapaliyal

Course Title : Fundamentals of Entomology 4(3+1)

UNIT-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.

UNIT-II

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, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

UNIT-III

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.

UNIT-IV

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

UNIT-V

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, Tettigonidae, 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, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae,

Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae;
Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

Practical

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

References

1. Plant Protection Techniques – P.B. Chatterjee
2. Text Book of Agricultural Entomology – H.S. Pruthi
3. General and Applied Entomolog – K.K. Nayar, T.N.
4. Text book of Entomology – Pruthi, H.S.
5. Economic and Applied Entomology – Ashok Kumar and Prem Mohan Nigam
6. A Test book of Applied Entomology (Vol. II) – K.P. Shrivastava

Course Title : Fundamentals of Agricultural Extension Education 3(2+1)

Theoy

UNIT-I

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.

UNIT-II

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.);

UNIT-III

various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.).

UNIT-IV

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.

UNIT-V

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

Practical

1. To get acquainted with university extension system.
2. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids,
3. Preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories;
4. Presentation skills exercise; micro teaching exercise;
5. 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:
6. 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.

References

1. Extension Education in Community Development – Directorate of Extension, Ministry of Agriculture, Govt. of India
2. Education and Communication for Development – Dhama, O.P. and Bhatnagar, O.P., Oxford and IBH Publicity Co. New Delhi
3. An Introductory of Agricultural Extension – Mosher, A.T.
4. Extension Communication and Management - Ray G.L., Naya Prakashan 206 Bidhan Sarani, Calcutta-6
5. Rural Development – Principles, Policies and Management – Singh, Katar, Sage Publications, New Delhi
6. Dimensions of Agriculture Extension – Singh, A.K. and K. Roy Burman, Aman Publication, Merut
7. Text Book of Extension Education – Singh, Ranjeet, Oxford & IBH
8. Extension Education – Reddy, A.V.V., Laxmi Press, Baptala (AP)
9. An Introductory to Extension Education – Supe, S.V., Oxford & IBC Published Co. New Delhi

Course Title : Communication skills and Personality Development 2(1+1)

Theoy

UNIT-I

Communication Skills: Structural and functional grammar; meaning and process of communication,

UNIT-II

verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills;

UNIT-III

field diary and lab record; indexing, footnote and bibliographic procedures.

UNIT-IV

Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting;

UNIT-V

individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical

1. Listening and note taking, writing skills, oral presentation skills;
2. field diary and lab record; indexing, footnote and bibliographic procedures.
3. Reading and comprehension of general and technical articles,
4. precise writing, summarizing, abstracting; individual and group presentations.
5. methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition;
6. Principles and Functions of Communication, models and barriers to communication.
7. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

References

1. English Language and Indian Culture – Tribhuwan Nath Shukla
2. English Conversation Practice – Grant Taylor
3. A Course in Phonetics and Spoken English – J. Sethi and P.V. Dhamija
4. Objective English – Hari Mohan Prasad
5. High School English Grammar – Wren and Martinin

III Semester		
1	Crop Production Technology- I (Kharif Crops)	2(1+1)
2	Fundamentals of Plant Breeding	3(2+1)
3	Agricultural Finance and Cooperation	3(2+1)
4	Agri-Informatics	2(1+1)
5	Farm Machinery and Power	2(1+1)
6	Production Technology for Vegetables and Spices	2(1+1)
7	Environmental Studies and disaster Management	3(2+1)
8	Statistical Methods	2(1+1)
9	Livestock and Poultry Management	4(3+1)
	Total	**23(14+9)**

Course Title : Crop Production Technology-I (*Kharif* Crops) 2(1+1)

Theory

UNIT-I

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,

UNIT-II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. pulses-pigeonpea, mungbean and urdbean;

UNIT-III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. oilseeds- groundnut, and soybean;

UNIT-IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. fibre crops- cotton & jute;

UNIT-V

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. forage crops-sorghum, cowpea, cluster bean and napier.

Practical

1. Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton,
2. effect of seed size on germination and seedling vigour of *kharif* season crops,
3. effect of sowing depth on germination of *kharif* crops,
4. identification of weeds in *kharif* season crops, top dressing and foliar feeding of nutrients,
5. study of yield contributing characters and yield calculation of *kharif* season crops,
6. study of crop varieties and important agronomic experiments at experimental farm.
7. study of forage experiments, morphological description of *kharif* season crops,
8. visit to research centres of related crops.

Reference Book

1. Scientific Crop Production KHARIF CROPS - Dr. Ahlawat , Dr. Om Prkash
2. [kjhQ dh Qlysa - Dr. Ahlawat , Dr. Om Prkash

Course Title : Fundamentals of Plant Breeding 3(2+1)

Theory

UNIT-I

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding,

UNIT-II

Modes of reproduction and apomixes, self-incompatibility and male sterility-genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/ diversity,

UNIT-III

Components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept.

UNIT-IV

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

UNIT-V

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

Practical

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

References

1.	Plant Breeding	–	B.D. Singh
2.	Principles and Practices of Plant Breeding	–	J.R. Sharma
3.	Breeding field crops	–	J.M. Poehlman and D.A. Sleper
4.	Principles of Plant Breeding	–	R.C. Choudhary

Course Title : Agricultural Finance and Co-Operation 3(2+1)

Theory

UNIT-I

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification.

UNIT-II

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.

UNIT-III

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

UNIT-IV

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture

UNIT-V

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.

Practicals

1. Determination of most profitable level of capital use.
2. Optimum allocation of limited amount of capital among different enterprise.
3. Analysis of progress and performance of cooperatives using published data.
4. Analysis of progress and performance of commercial banks and RRBs using published data.
5. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures.
6. 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. An Introduction to Agricultural Finance – U.K. Pandey, Himalayan Publication Ltd., New Delhi.
2. Agricultural Finance - Theory and Practical – J.P. Singh
3. Agricultural Finance - Theory and Practical – Kahlon and Tyagi
4. Agricultural Finance and Management – S. Subba Reddy and P. Raghuram

Course Title : Agri-Informatics 2(1+1)

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.

UNIT-IV

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.

UNIT-V

Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

Practical

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

References

- कम्प्यूटर के मूल तत्व – शर्मा डॉ. सिरोही एवं डॉ. सिंह
- कम्प्यूटर जागरूकता – शर्मा डॉ. सिरोही एवं डॉ. सिंह
- Computer Application in Modern Agriculture - Gaurav Jain

Course Title : Farm Machinery and Power 2(1+1)

Theory

UNIT-I

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines ,

UNIT-II

Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor

UNIT-III

Familiarization with Power transmission system: clutch, gear box, differential and final drive of a tractor, Tractor types, Cost analysis of tractor power and attached implement,

UNIT-IV

Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations,

UNIT-V

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's

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

References

1. Elements of Agricultural Engineering – Dr. Jagdishwar Shay
2. Principle of Agricultural Engineering Vol. I – T.P. Ojha, A.M. Michael
3. Elements of Agricultural Engineering – Dr. O.P. Singhal
4. कृषि अभियंत्रण ृ प्रो. रन्धावा चौहान

Course Title : Production Technology for Vegetable and Spices 2 (1+1)

Theory

UNIT-I

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening

UNIT-II

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 vegetables - Tomato, Brinjal, Cucumber, Gourds, Pumpkin, French bean and Peas.

UNIT-III

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 spices- Chilli, Capsicum, Melons, Onion and Garlic;

UNIT-IV

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 vegetables- Cabbage, Cauliflower, Knol-khol; Carrot and Raddish, Leafy vegetables such as Amaranth and Palak.

UNIT-V

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 Root crops such as, Beetroot; Tuber crops such as Potato and Perennial vegetable crops.

Practical

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

References

1. Vegetable crops in India – T.K. Bose and M.G. Som
2. Production Technology of Vegetable crops – S.P. Singh
3. Production Technology of Vegetable crops – K.G. Shanumughavelu
4. Minor spices – J.S. Purthi
5. Spices – V.B. Singh and K. Singh

6 Medicinal, Aromatic, Plantation and Spices – N. Kumar

Course Title : Environmental Studies and Disaster Management 3 (2+1)

Theory

UNIT- I

Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

UNIT-II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

UNIT-III

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

UNIT-IV

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.

UNIT-V

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

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

References

1. Principles of Agricultural Ecology - G.S. Dhaliwal & G.S. Klear
2. Fundamentals of Environmental Biology - K.C. Agrawal
6. Environmental Studies - S. Singhal and N. Singhal
7. Essentials of Environmental Science - Dhaliwal, G.S. and Kukal, S.S.
8. Environmental Biology - P.D. Sharma
9. Environmental Studies - Rajesh Dharkar

Course Title : Statistical Methods 2(1+1)

Theory

UNIT-I

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

UNIT-II

Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability.

UNIT-III

Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

UNIT-IV

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.

UNIT-V

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

Practical

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

References

1. Fundamentals of Mathematical Statistics – S.C. Gupta and V.K. Kapoor
2. Basic Statistics – B.L. Agrawal
3. Design and Analysis of Experiments for Agriculture workers – B.L. Mishra
4. Theory of Sample Surveys and Statistical – K.S. Kushwaha and

Course Title : Livestock & Poultry Management 4 (3+1)

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry Improvement of farm animals and poultry.

UNIT-IV

Digestion in livestock and poultry. Classification of feed stuffs. 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.

UNIT-V

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

Practical

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

References

1.	Livestock Production Management	-	Dr. N.S.R. Shastry, Dr. R.A. Singh and Dr. Thomas
2.	A Text Book of Animal Husbandry	-	Dr. G.C. Banerjee
3.	Poultry Production	-	Dr. R.A. Singh and others
4.	Animal Husbandry and Draining	-	Dr. Jagdish Prasad
5.	Animal Husbandry Dairy India – 2007	-	Dr. Harbansh Singh & Dr. Moor
6.	पशुधन उत्पादन एवं प्रबंध	-	Bhati and Dahma
7.	Live stock and poultry Management	-	Prof. I. J. Jauhar and Dr,Gupta

IV Semester		
1	Crop Production Technology – II (Rabi Crops)	2(1+1)
2	Production Technology for Ornamental Crops, MAI and Land Croping	2(1+1)
3	Renewable Energy and Green Technology	2(1+1)
4	Problematic Soils and their Management	2(2+0)
5	Production Technology For Fruit and Plantation Crops	2(1+1)
6	Principles of Seed Technology	3(1+2)
7	Farming System & Sustainable Agriculture	1(1+0)
8	Agricultural Marketing Trade & Prices	3(2+1)
9	Introductory Agro-meteorology & Climate Change	2(1+1)
10	Elective Course (Biopesticides & Biofertilizers)	3 credit
	Total	**19(11+8)+3Cr. Hours**

Course Title : Crop Production Technology-II (*Rabi* crops) 2(1+1)

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops oilseeds-rapeseed, mustard and sunflower;

UNIT-IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella,

UNIT-V

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops Forage crops-berseem, lucerne and oat.

Practical

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

Reference Book

1. **Scientific Crop Production RABI CROPS - Dr. Ahlawat , Dr. Om Prkash**
2. **रवी की फसलें - Dr. Ahlawat , Dr. Om Prkash**

Course Title : Production Technology for Ornamental Crops, MAPs and Landscaping 2 (1+1)

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

Package of practices for loose flowers like marigold and jasmine under open conditions.

UNIT-IV

Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol

UNIT-V

Production technology of important aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Practical

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

Reference Book

- **A Text Book of Ornamental Gardenign - G.S. Saini**
- अलंकृत उद्यानिकी एवं औशधीय पौधे . गंगा भारण सैनी

Course Title : Renewable Energy and Green Technology 2(1+1)

Theory

UNIT-I

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

UNIT-II

Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and

bio oil

UNIT-III

Production and their utilization as bioenergy resource, introduction of solar energy, collection and their application,

UNIT-IV

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy

UNIT-V

Solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

Practical

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

References

1. New and Renewable Energy Sources – A.N. Mahur, N.S. Rathore
2. Bio-gas Technology – K.C. Khandelwal and S.S. Mandi
3. Renewable Energy Sources – J.N. Twivell and A. Weir
4. Bio-mass Combustion Technologies – FAO 1988
5. Advances in biogas technologies – O.P. Chawla
6. Solar Energy – S.P. Sukhatme
7. Non conventional Sources of Energy – G.D. Rai

Course Title : Problematic Soils and their Management (New) 2(2+0)

Theory

UNIT-I

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

UNIT-II

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

I **UNIT-III**

Irrigation water – quality and standards, utilization of saline water in agriculture.

UNIT-IV

Remote sensing and GIS in diagnosis and management of problem soils.

UNIT-V

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

Reference Book

- समस्याग्रस्त मृदाएँ एवं बंजर भूमि प्रबन्धन – डॉ. शर्मा
- Management of Problem Soil & Waste Land- Dr. Kumar

Course Title : Production Technology for Fruit and Plantation Crops 2(1+1)

Theory

UNIT-I

Importance and scope of fruit and plantation crop industry in India.Importance of rootstocks.

UNIT-II

Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi

UNIT-III

Production technologies for the cultivation of major fruits-papaya, sapota, apple, pear, peach, walnut, almond and;

UNIT-IV

Production technologies for the cultivation of minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry

UNIT-V

Production technologies for the cultivation of plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

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

References

1. Fruits : Tropical and Substropical – Bose and Mitra
2. Plant propagation practices – Hortmann and Kester
3. Fruit culture in India – Sham Singh
4. Udhyan Vigyan – S.S. Shrivastava
5. Plant propagation – M.K. Sadhu
6. Fruit growing – J.S. Bal
7. Basic Horticulture – Jitendra Singh
8. Fruit growing in India – W.B. Hayes

1. Fruit in India, Tropical and Substropical – T.K. Bose

2. Medicinal, Aromatic, Plantation and Spices – N. Kumar

Course Title : Principles of Seed Technology 3(1+2)

Theory

UNIT-I

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control

UNIT-II

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.

UNIT-III

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.

UNIT-IV

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.

UNIT-V

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

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

References

1. Seed Technology – Harpal Singh Tomar, Publisher of Agra
2. Seed Technology – R.L. Agrawal, Kalyani Publisher

Course Title : Farming System and Sustainable Agriculture 1(1+0)

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

ntegrated 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,

UNIT-V

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.

References

1. Cropping and Farming system – S.C. Panda, Agrobios Publication
2. Proceeding of Symposium on Efficient Cropping System – Indian Society of Cropping System, Agronomy, New Delhi
3. Principles and Practices of Agronomy – S.S. Singh, Kalyani Publication
4. Farm Management – S.K. Tondon and S.P. Dondhyal

Course Title : Agricultural Marketing, Trade and Prices 3(2+1)

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

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);

UNIT-IV

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:

UNIT-V

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

Practical

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

References

1.	Agricultural Marketing in India	–	S.S. Acharya and N.L. Agrawal, Oxford and IBH Publication Co. Pvt. Ltd., New Delhi
2.	An introduction to Marketing	–	Amarchand, D. and B. Vardhrajan, Vikash Publication House Pvt. Ltd., New Delhi
3.	Export Marketing	–	Balagopal
4.	Agricultural Marketing and Cooperation	–	L.K. Wader and C. Murty, ICAR, New Delhi

Swami Vivekanand University, Sagar (M.P.)

Course Title : Introductory Agrometeorology & Climate Change 2(1+1)

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

Artificial rain making. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave.

UNIT-V

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

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

References

6.	Climatology	-	Lal, D.S. (1997), Sharda Pustak Bhawan Publication, Allahabad
7.	A Practical Guide on Agro meteorology	-	K.K. Agrawal and A.P. Upadhyay
8.	Basic Principles of Agricultural Meteorology	-	V. Radha Krishna Murthy
9.	Agricultural Meteorology	-	GSLHV Prasad Rao

ELECTIVE COURSE

Course Title : Biopesticides & Biofertilizers **3(2+1)**

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*; Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, Hapalosiphon

UNIT-IV

Structure and characteristic features of fungal biofertilizers- AM mycorrhiza and ectomycorhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production

UNIT-V

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

Practical

1. Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus, Metarhyzium* etc. and its production.
2. Identification of important botanicals.
3. Visit to biopesticide laboratory in nearby area.
4. Field visit to explore naturally infected cadavers.
5. Identification of entomopathogenic entities in field condition.
6. Quality control of biopesticides.

7. Isolation and purification of *Azospirillum* , *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria.
8. Mass multiplication and inoculums production of biofertilizers.
9. Isolation of AM fungi -Wet sieving method and sucrose gradient method.
10. Mass production of AM inoculants.

Reference Book

1. **Hand Book of Bio fertilizer & Bio pesticides - A.M. Deshmukh, R.M. Khobragade , P.P. Dixit**

V Semester		
1	Principles of Integrated Pest and Diseased Management	3(2+1)
2	Manures, Fertilizers and Soil Fertility Management	3(2+1)
3	Pests of Crops and Stored Grain and their Management	3(2+1)
4	Diseases of Field and Horticultural Crops and their Management - I	3(2+1)
5	Crop Improvement – I (Kharif Crops)	2(1+1)
6	Entrepreneurship Development and Business Communication	2(1+1)
7	Geoin Formatics and Nano-technology and Precision Farmig	2(1+1)
8	Prctical Crop Production – I (Kharif Crops)	2(0+2)
9	Intellectual Property Rights	1(1+0)
10	Agri-business Management	**3 (2+1)**
	Total	24(14+10)

1. Principles of Integrated Pest and Disease Management **3(2+1)**

Theory

Unit I

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM.

Unit II

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.

Unit III

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.

Unit IV

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.

UNIT V

Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

Practical

1. Methods of diagnosis and detection of various insect pests, and plant diseases,
2. Methods of insect pests and plant disease measurement,
3. Assessment of crop yield losses, calculations based on economics of IPM,
4. Identification of biocontrol agents, different predators and natural enemies.
5. Mass multiplication of *Trichoderma, Pseudomona*s, *Trichogramma*, NPV etc.
6. Identification and nature of damage of important insect pests and diseases and their management.
7. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases.
8. Plan & assess preventive strategies (IPM module) and decision making.
9. crop monitoring attacked by insect, pest and diseases .
10. Awareness campaign at farmers fields.

References

1.	Plant Protection Techniques	–	P.B. Chatterjee
2.	Text Book of Agricultural Entomology	–	H.S. Pruthi
3.	General and Applied Entomolog	–	K.K. Nayar, T.N. Ananthakrishnan and B.V. David
4.	Insect Pests of Field Crops	–	S. Pradhan
5.	Introduction of Plant Quarantine	–	Abhishek Shukla and O.P. Veda
6.	मधुमक्खी पालन	–	ICAR Publication
7.	Destructive and Useful Insects	–	Mctcalf and Flint
8.	Integrated Pest Management : concept and approach	–	Dhaliwal and Arora
9.	Insect Resistance in Crop Plants	–	Painter, R.H.

2. Manures, Fertilizers and Soil Fertility Management **3(2+1)**

Theory

UNIT I

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

UNIT II

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

UNIT III

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.

UNIT IV

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.

UNIT V

Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

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

References

1. The Nature Properties of Soil – Brady, N.C. & Weil R.R.
2. Fundamentals of Soil Science
3. Soil Fertility and Fertilizers – Nelson Tisdale
4. Methods of Soil Fertilization – A.J. Pieters
5. Organic Farming Theory and Biofertilizer in Agriculture – N.S. Subbarao

3. Pests of Crops and Stored Grains and their Management 3(2+1)

Theory

UNIT I

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

UNIT II

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

UNIT III

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.

UNIT IV

Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management.

UNIT V

Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

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

References

1. Storage Pest Management – Sharma, S. and Choudhary, A.
2. पौध संरक्षण मार्गदर्शिका – Dhamdhare, Chawan, Kishore and Bartiya
3. Management of Insect Pests of Horticultural Crops – Gupta, H.C.L.
4. Text book of Entomology – Pruthi, H.S.
5. फलों के हानिकारक कीट – Virendra Kumar Sharma
6. सब्जीयों के हानिकारक कीट – Virendra Kumar Sharma
7. Cotton pests and Bio control agents – Sathe, T.V.
8. Economic and Applied Entomology – Ashok Kumar and Prem Mohan Nigam
9. A Test book of Applied Entomology (Vol. II) – K.P. Shrivastava

4. Diseases of Field & Horticultural Crops & their Management-I 3(2+1)

Theory

UNIT - I

Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro;Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose,

UNIT -II

Symptoms, etiology, disease cycle and management of major diseases of following crops: 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;

UNIT – III

Symptoms, etiology, disease cycle and management of major diseases of following crops: 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.

UNIT - IV

Symptoms, etiology, disease cycle and management of major diseases of following crops: Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top;Papaya: 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; Symptoms, etiology, disease cycle and management of major diseases of following crops:

UNIT - V

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

Practical

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

References

1.	Plant Pathology	-	G.N. Agrios
2.	Plant Diseases	-	R.S. Singh
3.	Plant Pathology	-	P.D. Sharma
4.	Diseases of crop plants in India	-	G. Rangaswami
5.	फसलों के रोग	.	जी.बी पंत कृषि वि.वि., पंतनगर पब्लिकेशन
6.	पादप रोग विज्ञान	.	बी.बी. सिंह
7.	Practical manual of Plant Pathology	-	V.N. Pathak
8.	Essentials of Plant Pathology	-	V.N. Pathak
9.	Plant Pathology	-	M.N. Kamat

5. Crop Improvement – I (*Kharif*) **2(1+1)**

Theory

UNIT I

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

UNIT II

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

UNIT III

Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops;

UNIT IV

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

UNIT V

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

Practical

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

6. Entrepreneurship Development and Business Communication 2 (1+1)

Theory

UNIT I

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

UNIT II

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

UNIT III

Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management.

UNIT IV

Project Planning Formulation and report preparation

UNIT V

Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

Practical

1. Assessing entrepreneurial traits, problem solving skills.
2. Managerial skills and achievement motivation.
3. Exercise in creativity, time audit through planning.
4. Monitoring and supervision.
5. Identification and selection of business idea.
6. Preparation of business plan and proposal writing.
7. Visit to entrepreneurship development institute and entrepreneurs.

References

1. Trainer's Manual on Developing Entrepreneurial Motivation – Akhori, M.M.P., Mishra, S.P. and Sengupta, Rita (1989), NIESBUD
2. Entrepreneurial Development – Khanka, S.S., S. Chand Co. Ltd. Ramnagar, New Delhi
3. Fundamental of Entrepreneurship – Agrawal R.C., Laxmi Narayan Agrawal, Agra (U.P.)
4. Dynamics of Entrepreneurial – Desai, Vasant, Himalayan Publication House, New Delhi
5. Farm Communication through Mass in the New Millennium – Samant, A.G., Associated Media Publishing Company, Karol Bag, New Delhi
6. Entrepreneurship Development Programme in India and its relevance – Patel, V.G.

7. Geoinformatics, Nano-technology and Precision Farming 2(1+1)

Theory

UNIT I

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

UINT II

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

UNIT III

Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions;

UNIT IV

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

UNIT V

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

Practical

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

Reference

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

8. Practical Crop Production-I *(Kharif Crops)* **2(0+2)**

Practical.

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

9 **Intellectual Property Rights** **1(1+0)**

Theory

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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.

UNIT V

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.

10 Agri-business Management **3 (2+1)**

Theory

UNIT I

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries.

UNIT II

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.

UNIT III

Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget.

UNIT IV

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.

UNIT V

Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

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

References

1.	Agribusiness Management	–	W. David Downey and Steven P. Erickson
2.	Introduction of Agril. Business Management	–	Davis, J. and Gold Berg
3.	Project Management and Control	–	Rao
4.	Project Management	–	S. Choudhary, Hill Publication Company, New Delhi
5.	Project Management	–	Nagaraja
6.	Agri. Business Management	–	Broadway, Himalaya Publication House, New Delhi
7.	Project Planning, Analysis, Selection, Implementation and Review	–	Chandra

VI Semester		
1	Rain fed Agriculture & Watershed Management	2(1+1)
2	Protected Cultivation and Secondary Agriculture	2(1+1)
3	Diseases of Field and Horticultural Crops and their Management – II	3(2+1)
4	Post-harvest management and value addition of Fruits and Vegetables	2(1+1)
5	Management of Beneficial Insects	2(1+1)
6	Crop Improvement – II (Rabi Crops)	2(1+1)
7	Practical Crop Production – II (Rabi Crops)	2(0+2)
8	Principles of Organic Farming	2(1+1)
9	Farm Management, Production & Resource Economics	2(1+1)
10	Principles of Food Science and Nutrition	2(0+2)
11	Agrochemicals	3(2+1)
	Total	24(11+13)

1. Rain fed Agriculture and Watershed Management **2(1+1)**

Theory

UNIT - I

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

UNIT - II

Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques,

UNIT - III

Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought;

UNIT - IV

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

UNIT - V

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

Practical

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

Reference

Ghanshyam Das. 2008. Hydrology and Soil Conservation Engineering: Including Watershed Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi.

Katyal, J.C., R.P. Singh, Shriniwas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra.

1995. Field Manual on Watershed Management. CRIDA, Hyderabad.

Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.

Sharda, V.N., A.K. Sikka and G.P. Juyal. 2006. Participatory Integrated Watershed Management: A Field Manual. Central Soil and Water Conservation Research and Training Institute, Dehradun.

Singh, G.D. and T.C. Poonia. 2003. Fundamentals of Watershed Management Technology.
Yash Publishing House, Bikaner.

Singh, P.K. 2000. Watershed Management: Design and Practices. E-media Publications, Udaipur.

Singh, R.V. 2000. Watershed Planning and Management. Yash Publishing House, Bikaner.

2. Protected Cultivation and Secondary Agriculture **2(1+1)**

Theory

UNIT - I

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.

UNIT - II

Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

UNIT - III

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

UNIT - IV

Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer).

UNIT - V

Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

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

3. Diseases of Field & Horticultural Crops & their Management-II 3(2+1)

Theory

UNIT - I

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

Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle;

Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng;

UNIT - II

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

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

UNIT - III

Symptoms, etiology, disease cycle and management of following diseases

Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose;

UNIT - IV

Symptoms, etiology, disease cycle and management of following diseases

Horticultural Crops 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;

UNIT - V

Symptoms, etiology, disease cycle and management of following diseases Horticultural Crops Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

Practical

1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.

2. Field visit for the diagnosis of field problems.

3. Collection and preservation of plant diseased specimens for herbarium.

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

References

1. Plant Pathology - G.N. Agrios
2. Plant Diseases - R.S. Singh
3. Plant Pathology - P.D. Sharma
4. Diseases of crop plants in India - G. Rangaswami
5. फसलों के रोग . जी.बी पंत कृषि वि.वि., पंतनगर पब्लिकेशन
6. पादप रोग विज्ञान . बी.बी. सिंह
7. Practical manual of Plant Pathology - V.N. Pathak
8. Essentials of Plant Pathology - V.N. Pathak
9. Plant Pathology - M.N. Kamat

4. Post-harvest Management and Value Addition of Fruits and Vegetables 2(1+1)

Theory

UNIT - I

Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses;

UNIT - II

Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening;

UNIT - III

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

UNIT - IV

Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages.

UNIT - V

Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning –– Concepts and Standards, packaging of products.

Practical

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

References

1. Principles and Practices of Post Harvest Technology – P.H. Panday
2. Post Harvest Technology of Fruits and Vegetables – L.R. Verma and V.K. Joshi
3. Post Harvest Technology of Horticultural Crops – K.P. Sudheer
4. Post Harvest Management of Horticultural Crops – M.A. Mir
5. Marketing of Processed, Fruits and Vegetables – M. Choudhory
6. Fruits and Vegetable preservation – Girdharilal,G.S. Sidhappa and G.L. Tondan

5. Management of Beneficial Insects **2(1+1)**

Theory

UNIT - I

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease.

UNIT - II

Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Practical

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

References

1.	Plant Protection Techniques	–	P.B. Chatterjee
2.	Text Book of Agricultural Entomology	–	H.S. Pruthi
3.	General and Applied Entomolog	–	K.K. Nayar, T.N. Ananthakrishnan and B.V. David
4.	Insect Pests of Field Crops	–	S. Pradhan
5.	Introduction of Plant Quarantine	–	Abhishek Shukla and O.P. Veda
6.	मधुमक्खी पालन	–	ICAR Publication
7.	Destructive and Useful Insects	–	Mctcalf and Flint
8.	Integrated Pest Management : concept and approach	–	Dhaliwal and Arora
9.	Insect Resistance in Crop Plants	–	Painter, R.H.

6. Crop Improvement – II (*Rabi*) **2(1+1)**

Theory

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

Hybrid seed production technology of *rabi* crops

UNIT - V

Ideotype concept and climate resilient crop varieties for future.

Practical

1. Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion;

2. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods;

3. Study of field techniques for seed production and hybrid seeds production in *Rabi* crops;

4. Estimation of heterosis, inbreeding depression and heritability;

5. Layout of field experiments;

6. Study of quality characters,

7. study of donor parents for different characters;

8. Visit to seed production plots;

9. Visit to AICRP plots of different field crops

7. Practical Crop Production-II *(Rabi Crops)* **2(0+2)**

Practical

1. 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.

2. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.

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

8. Principles of Organic Farming **2(1+1)**

Theory

UNIT - I

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

UNIT – II

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

UNIT - III

Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production;

UNIT - IV

Operational structure of NPOP; Certification process and standards of organic farming;

UNIT – V

Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

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

Reference

1.	Organic Food Production in India - Status, Strategy and Scope	- -	Bhattacharya, P. 2003, Agribios (India), Jodhpur
2.	Organic Farming-Theory and Practices	-	Palanniappan, S.P. and Anandurai, K 1999, Scientific Publisher,Jodhpur
3.	Organic Farming	-	Lumpkin, N. 1990, Farming Press Books, IPSWITCH, U.K.
4.	Hand Book of Organic Farming	-	Sharma, A.K. 2001, Agribios (India), Jodhpur
5.	Organic Farming	-	Gupta, M.K. 2002, Moraka Foundation, Jodhpur
6.	Organic Farming for Sustainable Horticulture	-	Parvatha Reddy, P, Agribios (India), Jodhpur
7.	Emerging Trends in Biological Control of Phytophageous Insects	-	Ananthakrishnan, T.N. 1992, Oxford & IBH, New Delhi

9. Farm Management, Production and Resource Economics 2(1+1)

Theory

UNIT - I

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

UNIT – II

Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage.

UNIT – III

Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income.

UNIT – IV

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

UNIT – V

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

Practical

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

10. Principles of Food Science and Nutrition **2(2+0)**

Theory

UNIT – I

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

UNIT – II

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

UNIT –III

Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods);

UNIT – IV

Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.);

UNIT – V

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.

Reference

Potter NN & Hotchkiss JH. 1995. *Food Science.* Chapman and Hall Publishers.

Swaminathan M. 2005. *Handbook of Foods and Nutrition.* Ganesh and Co. Pvt. Ltd.

Swaminathan M. 1990. *Foopd Science, Chemistry and Experimental Foods.* BAPPCO.

Vickie A.,Vaclavik & Elizabeth W. Christian. 2003. Essentials of Food Science, 2nd Ed. Kluwer Academic/ Plenum Publishers, New York.

Swaminathan, M. (1988). Handbook of Food Science and Experimental Foods BAPPCO, Bangalore

Shakuntala Manay N, Shadaksharaswamy M (1998). Foods, Facts and Principles, New Age International Publishers, New Delhi

11 **. Agrochemicals** **3 (2+1)**

Theory

UNIT – I

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

UNIT – II

Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride.

UNIT – III

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.

UNIT – IV

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 potassiumchloride, potassium sulphate and potassium nitrate.

UNIT – V

Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

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

VII Semester			
Sr.No.	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA)		
	Activities	No. of Week	Credit Hours
1	General Orientation & On Campus Training by Different Faculties	1	14
2	Village Attachment	8	
3	Unit Attachment in Univ./College. KVK/Research Station Attachment	5	
4	Plant Clinic	2	02
5	Agro-Industrial Attachment	3	04
6	Project Report Preparation, Presentation and Evaluation	1	
7	Total Weeks for RAWE & AIA	20	20

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

RAWE Component – I

Village Attachment Training Programme

Sr.No	Activity	Duration
1	Prientation snd Survey of Village	1 Week
2	Agronomical interventions	1 Week
3	Plant Protection Interventions	1 Week
4	Soil Improvement Interventions (Soil Sampling and testing)	1 Week
5	Fruit and Vegetable Production Interventions	1 Week
6	Food Processing and Storage Interventions	1 Week
7	Animal Production Interventions	1 Week
8	Extension and Transfer of Technology Activates	1 Week

RAWE Component – II

Village Attachment Training Programme

Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 Weeks.

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

Activities and Tasks during Agro-Industrial Attachment Programme .

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

VIII 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 tin the VIII Semester.

Sr. No.	Title of the module	Credits
1	Commercial Horticulture	0+10
2	Commercial Beekeeping	0+10
3	Mushroom Cultivation Technology	0+10
4	Floriculture and Landscaping	0+10
5	Production Technology for Bio agents and Bio fertilizer	0+10
6	Poultry Production Technology	0+10
7	Soil, Plant. Water and Seed Testing	0+10
8	Food Processing	0+10
9	Seed Production and Technology	0+10
10	Agriculture Waste Management	0+10
11	Organic Production Technology	0+10
12	Commercial Sericulture	0+10

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

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**

Module-I. Commercial Horticulture:

Nursery production of fruit crops: Raising of rootstocks, grafting and budding of rootstocks, management of grafted plants, plant certification, packaging and marketing, quality control. Nursery production of ornamentals: Production of plantlets, production of potted plants, management and maintenance, sale and marketing. Protected cultivation of vegetables and flowers: Nursery raising/procurement and transplanting, management and maintenance of the crop, postharvest handling, quality control and marketing.

Module-II. Commercial Bee keeping:

Procurement and arrangement of bee keeping equipments. Location and collection of potent nectar yielding bee flora seeds from wild. Raising/ enriching the high nectar yielding bee flora in the campus. Location and hiving the natural bee colony from the wild. Establishing the apiary with suitable/favourable necessaries. Maintenance and multiplication of hived colonies. Management of natural enemies and diseases of bees. Maintenance of bee colonies during dearth and honey flow seasons. Harvesting and Processing of honey and bee wax. Marketing and cost analysis.

Module-III. Mushroom cultivation Technology:

Construction cultivation room/structure and Disinfection. Compost preparation & pasteurization. Procurement of mother culture and spawn preparation. Procurement of casing soil and preparation for production. Mushroom seeding, Casing with soil and maintenance, Harvesting, processing, Grading, packing, marketing and Cost economics of mushroom culture.

Module-IV. Floriculture and landscaping:

Preparation of project report, soil and water analysis, preparation of land and layout. Production and Management of commercial flowers. Harvesting and postharvest handling of produce. Marketing of produce, Cost Analysis, Institutional Management, Visit to Flower growing areas and Export House, Attachment with private landscape agencies. Planning and designing, site analysis, selection and use of plant material for landscaping. Formal and informal garden, features, styles, principles and elements of landscaping. Preparation of landscape plans of home gardens, farm complexes, public parks, institutions, high ways, dams and avenues. Making of lawns, use of software in landscape. Making of bouquets, button hole, wreath, veni and gazaras, car and marriage palaces. Dry flower Technology (identification of suitable species, drying, packaging and forwarding techniques).

Module-V. Production Technology For Bioagents and Biofertilizers:

Isolation and pure culture establishment of fertilisers and bio-pesticides. Culture methods and substrates. Scale of methods for bio-fertilizers and bio-pesticides. Substrate preparation and mixing techniques. Quality analysis of bio-fertilizers and bio-pesticides. Testing the final product in small scale level. Storage, marketing and cost analysis of bio-fertilizers and pesticides