Revised

UNDER GRADUATE CURRICULA & SYLLABUS

B.Sc. (Agriculture)

w.e.f. 2018-19

Semester System

As per ICAR Vth Deans Committee Report

Submitted by:

Convener Board of Studies in Agriculture

Kulbhaskar Ashram P.G. College, Prayagraj - 211001

Affiliated Prof. Rajendra Singh (Rajju Bhaiya)University

Prayagraj – 211001

B. Sc. (Ag) New Course

I[st] Semester						
Course title	Credit	Subject code	Evaluation marks			
			T	P	I	Total
Fundamentals of Agronomy	3 (2+1)	AG-101	50	30	20	100
Fundamentals of Genetics	3 (2+1)	AG-102	50	30	20	100
Fundamentals of Plant Biochemistry and Biotechnology	3 (2+1)	AG-103	50	30	20	100
Fundamentals of Horticulture	2 (1+1)	AG-104	50	30	20	100
Fundamentals of Agricultural Extension Education	3 (2+1)	AG-105	50	30	20	100
Introduction to Forestry	2 (1+1)	AG-106	50	30	20	100
Introductory Animal Husbandry	2 (1+1)	AG-107	50	30	20	100
Comprehension & Communication Skills in English	2 (1+1)	AG-108	50	30	20	100
Agricultural Heritage	1(1+0)	AGR-1	80	00	20	100
Introductory Biology/Basic Agriculture-I	2 (1+1)	AGR-4/2	80	00	20	100
Elementary Mathematics/ Basic Agriculture-II	2 (1+1)	AGR-5/3	80	00	20	100
NSS/NCC/Physical Education & Yoga Practices	2 (0+2)	AGNG-1	00	00	100	100
TOTAL	27(15+12)					
II[nd] Semester						
Course title	Credit	Subject code	Evaluation marks			
			T	P	I	Total
Fundamentals of Crop Physiology	2 (1+1)	AG-201	50	30	20	100
Fundamentals of Soil Science	3 (2+1)	AG-202	50	30	20	100
Fundamentals of Entomology	4(3+1)	AG-203	50	30	20	100
Fundamentals of Agricultural Economics	2 (2+0)	AG-204	80	00	20	100
Soil and Water Conservation Engineering	2 (1+1)	AG-205	50	30	20	100
Fundamentals of Plant Pathology	4(3+1)	AG-206	50	30	20	100
Production Technology for Vegetables and Spices	2 (1+1)	AG-207	50	30	20	100
Rural Sociology & Educational Psychology	2 (2+0)	AG-208	80	00	20	100
Poultry Production & Management	2 (1+1)	AG-209	50	30	20	100
Human Values & Ethics	1(1+0)	AGNG-2	80	00	20	100
TOTAL	24(17+7)					

T- Theory, P-Practical. I- Internal Assessment/Mid-term Assessment

III[rd] Semester						
Course title	Credit	Subject code	Evaluation marks			
			T	P	I	Total
Crop Production Technology – I (*Kharif* crops)	2 1+1)	AG-301	50	30	20	100
Practical Crop Production - I *(Kharif* crops*)*	2 (0+2)	AG-302	00	00	100	100
Fundamentals of Plant Breeding	3 (2+1)	AG-303	50	30	20	100
Agricultural Microbiology	2 (1+1)	AG-304	50	30	20	100
Agricultural Finance and Co-Operation	3 (2+1)	AG-305	50	30	20	100
Farm Machinery and Power	2 (1+1)	AG-306	50	30	20	100
Principles of Integrated Disease Management	3 (2+1)	AG-307	50	30	20	100
Environmental Studies & Disaster Management	3 (2+1)	AG-308	50	30	20	100
Statistical Methods	2 (1+1)	AG-309	50	30	20	100
Dairy Science	2 (1+1)	AG-310	50	30	20	100
Management of Beneficial Insects*	2 (1+1)	AG-311	50	30	20	100
TOTAL *This course will be taught in V[th] semester for students of batch 2017-18.	26(14+12)					

IV[th] Semester						
Course title	Credit	Subject code	Evaluation marks			
			T	P	I	Total
Crop Production Technology – II (*Rabi* crops)	2 (1+1)	AG-401	50	30	20	100
Practical Crop Production - II *(Rabi* crops*)*	2 (0+2)	AG-402	00	00	100	100
Principles of Seed Technology	3 (2+1)	AG-403	50	30	20	100
Problematic soils and their Management	2 (1+1)	AG-404	50	30	20	100
Pests of Crops and Stored Grain and their Management	3 (2+1)	AG-405	50	30	20	100
Renewable Energy and Green Technology	2 (1+1)	AG-406	50	30	20	100
Production Technology for Ornamental Crops, MAP and Landscaping	2 (1+1)	AG-407	50	30	20	100
Entrepreneurship Development and Business Communication	2 (1+1)	AG-408	50	30	20	100
Introductory Agro-meteorology & Climate Change	2 (1+1)	AG-409	50	30	20	100
Agri- Informatics	2 (1+1)	AG-410	50	30	20	100
Principles of Food Science and Nutrition	2 (1+1)	AG-411	50	30	20	100
TOTAL	24(12+12)					

T- Theory, P-Practical. I- Internal Assessment/Mid-term Assessment

Vth Semester						
Course title	Credit	Subject code	Evaluation marks			
			T	P	I	Total
Rainfed and dryland Agriculture	2 (1+1)	AG-501	50	30	20	100
Crop Improvement-I (*Kharif* crops)	2 (1+1)	AG-502	50	30	20	100
Principles of Integrated pest management	2 (1+1)	AG-503	50	30	20	100
Agricultural Marketing Trade & Prices	3 (2+1)	AG-504	50	30	20	100
Protected Cultivation and Secondary Agriculture	2 (1+1)	AG-505	50	30	20	100
Diseases of Field and Horticultural Crops and their Management-I	3 (2+1)	AG-506	50	30	20	100
Production Technology for Fruit and Plantation Crops	2 (1+1)	AG-507	50	30	20	100
Communication Skills and Personality Development	2 (1+1)	AG-508	50	30	20	100
Intellectual Property Rights	1(1+0)	AG-609	80	00	20	100
Food Processing and Safety Issues	2 (1+1)	AG-510	50	30	20	100
Elective-I	3 (2+1)	AGEL-1	50	30	20	100
TOTAL	24(14+10)					
VIth Semester						
Course title	Credit	Subject code	Evaluation marks			
			T	P	I	Total
Farming System, Precision Farming & Sustainable Agriculture	2 (1+1)	AG-601	50	30	20	100
Principles of Organic Farming	2 (1+1)	AG-602	50	30	20	100
Crop Improvement-II (*Rabi* crops)	2 (1+1)	AG-603	50	30	20	100
Manures, Fertilizers and Soil Fertility Management	3 (2+1)	AG-604	50	30	20	100
Farm Management, Production & Resource Economics	2 (1+1)	AG-605	50	30	20	100
Geo-informatics and Nanotechnology	2 (1+1)	AG-606	50	30	20	100
Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)	AG-607	50	30	20	100
Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)	AG-608	50	30	20	100
Watershed and Wasteland Management	2 (1+1)	AG-609	50	30	20	100
Elective-2	3 (2+1)	AGEL-2	50	30	20	100
Educational Tour	2 (1+1)	AGNG-3	50	30	20	100
TOTAL	25(14+11)					

T- Theory, P-Practical. I- Internal Assessment/Mid-term Assessment

***Course AG-311 Management of Beneficial Insects* will also be taught in Vth sem for students of batch 2017-18 only as it was left in IIIrd semester during 2018-19.**

VIIth Semester			
SN.	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA)		
	Activities	No. of weeks	Credit Hours
1	General orientation & On campus training by different faculties	1	14
2	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
3	Plant clinic	2	02
	Agro-Industrial Attachment	3	04
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

Marks Distribution:

S.No	Department	Credit Hours	Title of course	Evaluation marks			
				T	P	I	Total
1	Agronomy	2(0+2)	RAWE	00	00	100	100
2	Genetics & Plant Breeding	2(0+2)		00	00	100	100
3	Soil Science & Agricultural Chemistry	2(0+2)		00	00	100	100
4	Animal Husbandry and Dairying	2(0+2)		00	00	100	100
5	Agricultural Economics	2(0+2)		00	00	100	100
6	Agricultural Engineering	2(0+2)		00	00	100	100
7	Plant Pathology	2(0+2)		00	00	100	100
8	Horticulture	2(0+2)		00	00	100	100
9	Agricultural Extension	2(0+2)		00	00	100	100
10	Soil conservation	1(0+1)		00	00	100	100
11	Entomology	1(0+1)		00	00	100	100

T- Theory, P-Practical. I- Internal Assessment/Mid-term Assessment

RAWE Component –II

Agro Industrial Attachment

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

Activities and Tasks during Agro-Industrial Attachment Programme

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

VIIIth semester

Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIIIth **semester out of the following 12 modules .**

Sr.	Title of the module	Credits
1.	Production Technology for Bio-agents and Bio-fertilizer	10(0+10)
2.	Seed Production and Technology	10(0+10)
3.	Mushroom Cultivation Technology	10(0+10)
4.	Soil, Plant, Water and Seed Testing	10(0+10)
5.	Commercial Beekeeping	10(0+10)
6.	Poultry Production Technology	10(0+10)
7.	Commercial Horticulture	10(0+10)
8.	Floriculture and Landscaping	10(0+10)
9.	Food Processing	10(0+10)
10.	Agriculture Waste Management	10(0+10)
11.	Organic Production Technology	10(0+10)
12.	Commercial Sericulture	10(0+10)

Marks Distribution:

S.No	Department	Credit Hours	Title of course	Evaluation marks			
				T	P	I	Total
1	Concern	10(0+10)	Module-I	00	00	100	100
2		10(0+10)	Module-II	00	00	100	100

Evaluation of Experiential Learning Programme/ HOT

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

Discipline-wise summary of credit hours

S.N.	Group	Credits
1.	Agronomy	17
2.	Genetics & Plant Breeding	15
3.	Soil Science & Agricultural Chemistry	13
4.	Entomology	11
5.	Agricultural Economics	10
6.	Agricultural Engineering	10
7.	Plant Pathology	13
8.	Horticulture	10
9.	Agricultural Extension	09
10.	Soil conservation	09
11.	Statistics, Computer Application and I.P.R.	05
12.	Animal Husbandry and Dairying	10
13.	English	02
14.	Remedial Courses*	05 (Bio/ Math); 05 (Agriculture)
15.	NSS/NCC/Physical Education & Yoga Practices**	2
16.	Human Values and Ethics**	1
17.	Educational Tour**	2
Total		134 + 5* + 5**+ 6 credits elective =150
RAWE & ELP		20 +20
Grand Total		150+20+20=190

* Remedial courses ** Non-Gradial courses

Elective Courses : A student can offer one elective course out of the following during Vth and VIth semesters each.

S.N.	Courses	Department	Semester	Credit Hours
1.	Agribusiness Management	Ag Economics	Vth semester	3(2+1)
2.	Agrochemicals	Soil Science		3(2+1)
3.	Commercial Plant Breeding	Genetics & Plant breeding		3(1+2)
4.	Landscaping	Horticulture		3(2+1)
5.	Food Safety and Standards	Animal Husbandry and Dairying		3(2+1)
6.	Protected Cultivation	Ag Engineering		3(2+1)
7.	Biopesticides & Biofertilizers	Soil Science	VIth Semester	3(2+1)
8.	Hi-tech. Horticulture	Horticulture		3(2+1)
9.	Weed Management	Agronomy		3(2+1)
10.	System Simulation and Agro-advisory	Ag Engineering		3(2+1)
11.	Agricultural Journalism	Agril Extension		3(2+1)
12.	Fish /Duck/ Quail/ Rabbit culture	Animal Husbandry & Dairying		3(2+1)

AGRONOMY

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Fundamentals of Agronomy**	3 (2+1)	50	20	30	I

Theory

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

Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods, herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, harvesting and threshing of crops.

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Study of soil moisture measuring devices, Measurement of irrigation water.

Related Books

1. Principles of Agronomy- T.Y. Reddy & G.H.S. Reddy, Kalyani Publishers, New Delhi.
2. Principles of Crop Production- S.R. Reddy, Kalyani Publication.
3. Fundamentals of Agronomy- Dr. K.L. Nandeha, M. Nandeha, Kushal Publishers & Distributors, Varanasi.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	**Crop Production Technology-I (Kharif Crops)**	2 (1+1)	50	20	30	III

Theory

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

Practical

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean. Maize, groundnut and cotton, effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops, identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm. Visit to research centres related to crops.

Related Books

1. Agronomy of Field Crops- S.R. Reddy- Kalyani Publications
2. Textbook of Field Crop Production Vol –I & II by Dr. Rajendra Prasad, ICAR, Publication.
3. Modern Technique of Raising Field Crops By Chhidda Singh, Oxford & IBH Publishing Company, New Delhi.
4. Science of Crop Production (Kharif & Rabi) By G.S.Tomar, S.P.S. Tomar & S.N. Khajanji, Kushal Publication and Distributors, Varanasi.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Practical Crop Production-I** *(Kharif Crops)*	2 (0+2)	00	100	00	III

Practical

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

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Crop Production Technology-II** (Rabi crops)	2 (1+1)	50	20	30	IV

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane; other crop-Potato. Forage crops-berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops, study of morphological characteristics of *rabi* crops, study of yield contributing characters of *rabi* season crops, study of important agronomic experiments of *rabi* crops at experimental farms. Study of *rabi* forage experiments. visit to research stations of related crops.

Related Books

1. Agronomy of Field Crops- S.R. Reddy- Kalyani Publications
2. Textbook of Field Crop Production Vol –I & II by Dr. Rajendra Prasad, ICAR, Publication.
3. Modern Technique of Raising Field Crops By Chhidda Singh, Oxford & IBH Publishing Company, New Delhi.
4. Science of Crop Production (Kharif & Rabi) By G.S.Tomar, S.P.S. Tomar & S.N. Khajanji, Kushal Publication and Distributors, Varanasi.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
5	**Practical Crop Production-II** *(Rabi Crops)*	2 (0+2)	00	100	00	IV

Practical

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

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

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
6	**Rainfed and Dryland Agriculture**	2 (1+1)	50	20	30	V

Theory

Rainfed and dryland agriculture – Introduction, types and history. Problems & prospects of rainfed agriculture in India. Soil and climatic conditions prevalent in rainfed areas. Drought: types, effect of water deficit on physio – morphological characteristics of the plants. Mechanism of crop adoption under moisture deficit conditions. Efficient utilization of water through soil and crop management practices, management of crops in rainfed areas. Contingent crop planning for aberrant weather conditions. Precision agriculture; concepts and techniques; their issues and concerns for Indian agriculture.

Practical

Studies on climatic classifications, studies on rainfall pattern is rainfed areas of the country. Studies on cropping pattern of different dryland areas in the country and demarcation of dryland area on map of India. Interpretation of metrological data and scheduling of supplemental irrigations on the basis of evapo-transpiration demand of crops effective rainfall and its calculations. Visit to rainfed research stations/watersheds.

Related Books

1. Rainfed Agriculture & Watershed Management, By S.R. Reddy & G.P. Reddy, Kalyani Publications.
2. Rainfed Agriculture & Watershed Management, Dr. Rajesh Ahemed Sah, Kushal Publications, Varanasi.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
7	**Farming System, Precision Farming and Sustainable Agriculture**	2 (1+1)	50	20	30	VI

Theory

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Sustainable agriculture-problems and its impact on agriculture, conservation agriculture strategies, HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system components of IFS and its advantages, resource use efficiency and optimization techniques, farming system and environment,

Practical

- Tools for determining productions & efficiencies in cropping and farming systems.
- Indicators of sustainability of cropping & Farming systems
- Site specific development of IFS models for different agro-climatic zones.
- Visit of IFS models in different agro climatic zones of nearby state Universities/Institutes and farmer fields.

Related Books

1. Farming system & Sustainable Agriculture, S.R. Reddy, Kalyani Publications, New Delhi.
2. Krishi Pradaliyon se sum gatisheel krishi, Dr. P.K. Singh & Dr. S.P. Vishwakarma, Rama Publishing House, Meerut.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
8	**Principles of Organic Farming**	2 (1+1)	50	20	30	VI

Theory

Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and standards of organic farming.

Practical

Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Quality aspect, grading, packaging and handling.

Related Books

1. Principles of Organic Farming- S.R. Reddy, Kalyani Publications.
2. Basics of Organic Farming- Mamta Bansal- CBS Publication & Distributors, Pvt. Ltd., New Delhi, 011-23243014.

GENETICS AND PLANT BREEDING

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Fundamentals of Genetics**	3 (2+1)	50	20	30	I

Theory

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. cell division- mitosis and meiosis. Probability and Chi-square. Dominance relationships, gene interactions.

Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics. Mutation, classification methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders. Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Practical

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

Related Books

1. Fundamentals of Genetics- Phundan Singh, Kalyani Publihers.
2. Genetics- B.D. Singh, Kalyani Publishers.
3. Genetics and Breeding of Pulse Crops- Roshni Vijayan et al., Kalyani Publishers.
4. Genetics- P.K. Gupta, Rastogi Publications.
5. Genetics- Daniel Hartl and M. Ruvalo, Jones and Bartlett.
6. Genetics- A Molecular Approach, By Peter J. Russell, Pearson.
7. Concept of Genetics- Klug, Cummings, Spencer, Pearson.
8. Genetics- Robert I. Booker, McGraw Hill.
9. Genetics- Stricberger, M.W., PHI Learning.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	**Fundamentals of Crop Physiology**	2 (1+1)	50	20	30	II

Theory

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

Practical

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

Related Books

1. Fundamentals of Genetics- Phundan Singh, Kalyani Publihers.
2. Genetics- B.D. Singh, Kalyani Publishers.
3. Genetics and Breeding of Pulse Crops- Roshni Vijayan et al., Kalyani Publishers.
4. Genetics- P.K. Gupta, Rastogi Publications.
5. Genetics- Daniel Hartl and M. Ruvalo, Jones and Bartlett.
6. Genetics- A Molecular Approach, By Peter J. Russell, Pearson.
7. Concept of Genetics- Klug, Cummings, Spencer, Pearson.
8. Genetics- Robert I. Booker, McGraw Hill.
9. Genetics- Stricberger, M.W., PHI Learning.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Fundamentals of Plant Breeding**	3 (2+1)	50	20	30	III

Theory

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and 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

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

Related Books

1. Breeding of Field Crops- John M. Pochlman, Springer.
2. Breeding of Field Crops- V.L. Chopra, India Book House.
3. Breeding of Field Crops- D.A. Sleper, 5th edition, Blackwell Publishing House.
4. Principles of Plant Breeding- Robert W. Allarol, 2nd Edition, Willey.
5. Principles of Plant Breeding- Z.A. Dar, P.D. Meena et al., Raj Publishing House.
6. Fundamentals of Plant Breeding- B.D. Singh & Payal Bansal, Kalyani Publishers.
7. Plant Breeding- B.D. Singh, Kalyani Publishers.
8. Plant Breeding- Jack Brown & Peter Coligari, Willey BlackWell Publishing House.
9. Principles of Genetics and Breeding- George Acquaah, Willey Publishing House.

10. Principles and Procedure of Plant Breeding- G.S. Chahal and S.S. Gosal, Alpha Science International Ltd.
11. Plant Breeding Methods- Maha Balram, PHI Learning Pvt. Ltd.
12. Marker Assisted Plant Breeding -B.D. Singh & A.K. Singh, B.Rai, Springer.
13. Principles and Practices of Heterous Breeding- B. Rai, Agro Biological Publication.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Principles of Seed Technology**	3 (2+1)	50	20	30	IV

Theory

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important **cereals, pulses, oilseeds, fodder and vegetables**. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Practical

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

Related Books

1. Seed Science and Technology- L.O. Copeland & M.F. McDonald, Springer.
2. Textbook of Seed Science and Technology- Patmavathi, et al., New India Publishing Agency.
3. Textbook of Seed Science and Technology- Irfan Ali Khan, Agrotech Press.
4. Seed Science and Technology- Brijesh Tiwari, Oxford Company.
5. Seed Technology- D. Khare and M.S. Bhole, Scientific Publishers.
6. Principles of Seed Technology- Phundan Singh, Kalyani Publishers.
7. Seed Science and Technology- Sheela Verma, New Vishal Publications.
8. Seed Technology 2nd edition, R.L. Agarwal, Oxford and IBH Publishing House.
9. Principles of Seed Technology- B.L. Jana, Vishkar Publishers.
10. Seed Science and Technology-B.D. Singh and A.K. Joshi, Kalyani Publishers.
11. Seed Science and Technology- Subir Sen and Nabinananda Ghosh, Kalyani Publishers

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
5	**Crop Improvement – I (*Kharif*)**	2 (1+1)	50	20	30	V

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding - self pollinated, cross pollinated and vegetatively propagated crops; Major breeding objectives and procedures including conventional

and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

Emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, and Tobacco Maintenance breeding of different *kharif* crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Kharif* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

1. Plant Breeding- Jack Brown & Peter Coligari, Willey BlackWell Publishing House.
2. Principles of Genetics and Breeding- George Acquaah, Willey Publishing House.
3. Principles and Procedure of Plant Breeding- G.S. Chahal and S.S. Gosal, Alpha Science International Ltd
4. Seed Science and Technology-B.D. Singh and A.K. Joshi, Kalyani Publishers.
5. Fundamentals of Genetics- Phundan Singh, Kalyani Publihers.
6. Genetics- B.D. Singh, Kalyani Publishers.
7. Genetics and Breeding of Pulse Crops- Roshni Vijayan et al., Kalyani Publishers.
8. Genetics- P.K. Gupta, Rastogi Publications

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
6	Crop Improvement – II (*Rabi*)	2 (1+1)	50	20	30	VI

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Hybrid seed production technology of *rabi* crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potat, Berseem and Sugarcane, Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Rabi* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops

1. Plant Breeding- Jack Brown & Peter Coligari, Willey BlackWell Publishing House.
2. Principles of Genetics and Breeding- George Acquaah, Willey Publishing House.
3. Principles and Procedure of Plant Breeding- G.S. Chahal and S.S. Gosal, Alpha Science International Ltd
4. Seed Science and Technology-B.D. Singh and A.K. Joshi, Kalyani Publishers.
5. Fundamentals of Genetics- Phundan Singh, Kalyani Publihers.
6. Genetics- B.D. Singh, Kalyani Publishers.
7. Genetics and Breeding of Pulse Crops- Roshni Vijayan et al., Kalyani Publishers.
8. Genetics- P.K. Gupta, Rastogi Publications.

SOIL SCIENCE & AGRICULTURAL CHEMISTRY

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Fundamentals of Plant Biochemistry**	2 (1+1)	50	20	30	I

Theory

Importance of Biochemistry, Carbohydrate: Importance and classification of Monosaccharides, Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; 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. Classification of vitamin, structure, role and its deficiency symptoms. Nucleic acids: importance and classification; Structure of Nucleotides.

Phytohormone ; Occurrence, classification, structure, functions and important plant growth substance. Alkaloids: classification , general properties of canine Nicotine and papaverine.

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose (Reducing and non-reducing sugurs) / proteins. Titration methods for estimation of amino acids/lipids, paper chromatography. Estimation of vitamin C & determination of calcium by EDTA method.

Suggested Readings:-

1. Jain, J.L., Jain, Sanjay & Jain, Nitin (2007) Fundamentals of Biochemistry. S. Chand & Company Ramnagar New Delhi.
2. Bonner, J.E. (1996) Plant Biochemistry. Acadmic Press. Inc. New York.
3. Mc Larsen, A.D. & Peterson, G.H. (1967) Soil Biochemistry. Vol. XI, Marcel Dekker.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	**Fundamentals of Soil Science**	3 (2+1)	50	20	30	II

Theory

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy, classification of soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, EC, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids – inorganic and organic; silicate clays: constitution and properties; source of charge; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence of soil properties.

Practical :

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample. Its processing and storage. Study of soil forming rocks and minarals. Determination of soiol density, moisture content and porosity . Determination of soil texture by feel and Bouyoucos methods . Determination of soil pH and electrical conductivity. Estimation of organic matter content of soil.

Suggested Readings:-

1. Indian Society of Soil Science, 2002. Fundamentals of Soil Science, ISSS, New Delhi.
2. Das, D.K.(2010) Introductory Soil Science, Kalyani Publications New Delhi.
3. Brady, N.C. & Weil, R.R. (2002) The Nature and Properties of Soils, 13th Ed., Pearson Edu.

4. Bear, R.E. (1964) Chemistry of soil. Oxford & IBH.
5. Buol, EW, Hole, ED, Mac Cracken RJ & Southard RJ (1997) Soil Genesis & Classification,4th Ed. Panima Publications.
6. Singh, Vinay(2018) Soil Science, Bharti Bhandar, Meerut.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Agricultural Microbiology**	2 (1+1)	50	20	30	III

Theory

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological Nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: biofertililizers, biopesticides, biofuel production and biodegradation. Microbial degradation of organic matter in soil. Preparation of Vermicompost. Soil organisms: macro and micro organisms, their beneficial and harmful effects.

Introdution Microbial world: Prokaryotic and eukaryotic microbes, Bacteria; chemiautotrophy & photo autotrophy,

Practical

Introduction to microbiology laboratory and its equipments; principles of microscopy. Methods of sterilization. Nutritional media and their preparations, Enumeration of microbial population in soil – bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures.

Isolation of rizobium from legume root nodule. Gram staining of bacteria. Preparation of nutrient broth, BGA and Vermicompost.

Suggested Readings:-

1. Subbarao, N.S. ( ) Soil Microbiology, Oxford & IBH Publications.
2. Alexander, M. (1977) Introductory Soil Microbiology, John Wiley & Sons.
3. Sylvia, D.N. (2005), Principles and Applications of Soil Microbiology, Pearson Edu.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Problematic Soils and their Management**	2 (1+1)	50	20	30	IV

Theory

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

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

Practical

Determination of pH & EC in soil and water. Lime and Gypsum requirement in soil, ESP and SAR in Soils. Determination of Carbonate, Bicarbonate, Calcium, Magnesium, Chloride & RSC in irrigation water samples.

Suggested Readings:-

1. Das, D.K.(2010) Introductory Soil Science, Kalyani Publications New Delhi
2. Yadav, J.S.P., Agrawal R.R. and Gupta R.N.( ), Saline and Alkali Soils of India. I.A.R.I. New Delhi.
3. Biswas, T.D. and Narayanasamy, G. (Eds.)(1996). Soil Management in relation to land Degradation and Environment. Bull. Indian Society of Soil Science, 17, New Delhi.
4. Richards, L.A. ( ) Diagnosis and Improvement of saline and Alkali Soils. USDA, Hand

Book No. 60.

5. Brady, N.C. & Weil, R.R. (2002) The Nature and Properties of Soils, 13th Ed., Pearson Edu

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
5	**Manures, Fertilizers and Soil Fertility Management**	3 (2+1)	50	20	30	VI

Theory

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

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, complex fertilizers, nano fertilizers

Soil amendments, Fertilizers Storage, Fertilizer Control Order.

History of soil fertility and plant nutrition, criteria of essentiality, forms of nutrients in soil. Role, deficiency and toxicity Symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Plant analysis, rapid plant tissue tests. Indicator plants . Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

Introduction of analytical instruments and their applications, colorimetry and flame photometry. Estimation of soil organic carbon, Estimation of available N, available P, available K, available S, available Ca and Mg and available Zn in soils. Estimation of N,P & K in plants. Manures and fertilizers.

Suggested Readings:-

1. Tisdale, S.L., Nelson, S.L., Beaton, J.D. & Harlin, J.L.(1999). Soil Fertil.ty & Fertlizers, 5th Edition, Prentice Hall of India
2. Kanwar, J.S.(Ed.)(1976). Soil Fertility : theory & Practice, ICAR, New Delhi.
3. Das, D.K.(2010) Introductory Soil Science, Kalyani Publications New Delhi.
4. Tandon, HLS (2005). Fertilizers, Organic Manures & Biofertilizers a Product quality guide. for major & micronutrients, FDCO, New Delhi
5. Tandon, HLS (1993). Methods of Analysis of Soils, Fertilizers & Waters, FDCO, New Delhi.

ENTOMOLOGY

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Fundamentals of Entomology**	4 (3+1)	50	20	30	II

Part – I-

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and moulting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

Part-II

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

Part III

Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control-importance, hazards and limitations. repellents, antifeedants, hormones, attractants, gamma radiation. Insecticides Act 1968-Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.

Part – IV

Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Pyrrhocoridae, Lygaeidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Pseudococcidae; Lepidoptera: Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Muscidae, Tephritidae.

Practical

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

Related Books:

1. Fundamentals of Agriculture Entomology- P.K. Sehgal, Kalyani Publications.
2. Elements of Agriculture Entomology- G.S. Dhaliwal, Kalyani Publications.
3. Insect Structure and Function- R.F. Chapman, Publication: Cambridge University Press.
4. A Textbook of Entomology- Y.K. Mathur and K.D. Upadhayay, Aman Publishers.

Modern Entomology- D.B. Tembhare, Himalaya Publishing House

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	**Management of Beneficial Insects**	2 (1+1)	50	20	30	III

Theory

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

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

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products.

Practical

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

1. Textbook of bookkeeping perspective for skill development- Rahman Ataur, Kalyani Publications.
2. Bee and Beekeeping in India- D.P. Aral.
3. Honey Bee Disease and their Management- D.P. Aral, Kalyani Publishers.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Pests of Crops and Stored Grains and their Management**	3 (2+1)	50	20	30	IV

Theory

General account on nature and type of damage by different arthropods (mites) pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and Scientific name, order, family, host range, distribution, nature of damage and control practice of important insect pests of important field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to nearest FCI godowns.

Related Books

1. Stored Grain Pest and their Management, D.P. Khare, Kalyani Publishers.
2. Agriculture Insect Pest of Crop and their Control- V.P.S. Panwar, Kalyani Publishers.
3. Agricultural Pest of South Asia and their Management- A.S. Atwal & G.S. Dhaliwal, Kalyani Publishers.

4. Insect Pest of Vegetable Crops- R.S. Chandel, P.K. Mehta, P.C. Sharma, Kalyani Publications.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Principal of Integrated Pest Management**	2 (1+1)	50	20	30	V

Theory

Categories of insect pests IPM; Introduction, history, importance. concepts, principles and tools of IPM. Economic importance of insect pests, pest risk analysis. Mehods of detection and diagnosis of insect pest calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Survey surveillance and forecasting of Insect pest. Safety issues in pesticide uses.

Practical

Methodes of diagnosis and detection of various insect pests, Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of Trichogramma, NPV etc.

1. Textbook of IPM- Dhaliwal & G.S. Rana.
2. Integrated Pest Management. Concept and Approaches- G.S. Dhaliwal and G.S. Arora, Kalyani Publications.
3. A Textbook of Applied Entomology: Volume I- Concepts in Pest Management- K.P. Srivastava and G.S. Dhondiwal, Kalyani Publishers.
4. A Textbook of Applied Entomology: Volume II- Insects of Economic Importance- K.P. Srivastava and G.S. Dhondiwal, Kalyani Publishers.

AGRICULTURAL ECONOMICS

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Fundamentals of Agricultural Economics**	2 (2+0)	80	20	00	II

Theory

Economics: Meaning, scope and subject matter. definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. *Demand:* meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Concepts of rent, wage, interest and profit. *National income:* Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and 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. 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.

Related Books

1. R.K. Lekhi & Joginder Singh (2017), "Agriculture Economics" Kalyani Publishers.
2. Subba Reddy, P. Raghu Ram, T.V. Neelakanta Sastry & I Bhavami Devi, "Agricultural Economics" Oxford & IBH Publishing Co. Pvt. Ltd.
3. S.S. Chima & N. Singh, "Farm Management in India", Kalyani Publishers.
4. S.S. Johal & T.R. Kapoor, "Fundamentals of Farm Business Management", Kalyani Publishers.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	**Agricultural Finance and Co-Operation**	3 (2+1)	50	20	30	III

Theory

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

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

Practical's

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

Related Books

1. J.V. Vaishampayan, Micro-Economic Theory, Royal Publisher Company.
2. S. Subba Reddy & P. Raghu Ram, "Agricultural Finance and Management", Oxford & IBH Publishing Company Pvt. Ltd.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Agricultural Marketing, Trade and Prices**	3 (2+1)	50	20	30	V

Theory

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

Practical

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

Related Books:

1. S.S. Acharya & N.L. Agrawal, "Agricultural Marketing in India", Oxford & IBH Publishing Co. Pvt. Ltd.

2. Philip Kotler, "Marketing Management", Prentice Hall PTR, 2011

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Farm Management, Production and Resource Economics**	2 (1+1)	50	20	30	VI

Theory

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

Practical

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

Related Books:

1. Economics of Farm Production & Management", V.T. Roy & DVS Rao, Oxford & IBH Publishing Co. Pvt. Ltd.
2. S.P. Dhondyal, Farm Management "An Economic Analysis", Aman Publishing House.
3. A.N. Agarwal & Singh, K (1992), "Economics of Farm Management in India", Allied Publication.
4. Panda, S.C. (2007), "Farm Management & Agricultural Marketing", Kalyani Publication.

AGRICULTURAL ENGINEERING

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	Introductory Soil and Water Conservation Engineering	2 (1+1)	50	20	30	II

Theory

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

Practical

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

Related Books:

1. **Principal Of Agricultural Engineering.Vol -II , by A M Miechel, TP Ojha-Jain Brothers**
2. **Elements of Agricultural Engineering, by Jagdishwar Sahay-Standard Publisher**
3. **Agricultural Technologies on Agricultural Engineering Vol.I,- ICAR Publication**
4. **Agricultural Technologies on Agricultural Engineering Vol.II, - ICAR Publication**
5. **Agricultural Technologies on Natural Resources Management -ICAR Publication**
6. **Irrigation and Water Resource Engineering, Asawa G L, New Age International (P) Ltd**
7. **Soil Erosion and Conservation, R P Tiwari, New Age International (P) Ltd**
8. **Soil & Water Conservation Engineering, Bimal Chand Mall, Ashish Pandey -Kalyani Publications**

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	Farm Machinery and Power	2 (1+1)	50	20	30	III

Theory

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practicals

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and

transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery.

Related Books:

1. **Principal Of Agricultural Engineering Vol -I , by A M Miechel, TP Ojha- Jain Brothers**
2. **Elements of Agricultural Engineering, by Jagdishwar Sahay-Standard Publisher**
3. **Agricultural Technologies on Agricultural Engineering Vol.I,- ICAR Publication**
4. **Agricultural Technologies on Agricultural Engineering Vol.II, - ICAR Publication**
5. **Farm Power and Machinery, Sanjay Kumar, Kalyani Publications**

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Renewable Energy and Green Technology**	2 (1+1)	50	20	30	IV

Theory

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

Practical

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

Related Books:

1. **Elements of Agricultural Engineering, by Jagdishwar Sahay-Standard Publisher**
2. **Agricultural Technologies on Agricultural Engineering Vol.I,- ICAR Publication**
3. **Agricultural Technologies on Agricultural Engineering Vol.II, - ICAR Publication**
4. **Renewable Energy, Sanjay Kumar, Kalyani Publications**

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Protected Cultivation and Secondary Agriculture**	2 (1+1)	50	20	30	V

Theory

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. 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.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, re-circulatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green

house equipments. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

Related Books:

1. **Principal Of Agricultural Engineering.Vol -II , by A M Miechel, TP Ojha-Jain Brothers**
2. **Elements of Agricultural Engineering, by Jagdishwar Sahay-Standard Publisher**
3. **Agricultural Technologies on Agricultural Engineering Vol.I,- ICAR Publication**
4. **Agricultural Technologies on Agricultural Engineering Vol.II, - ICAR Publication**
5. **Agricultural Technologies on Natural Resources Management -ICAR Publication**

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
5	**Geo-informatics & Nano-technology**	2 (1+1)	50	20	30	VI

Theory

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

Practical

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

Related Books:

1. **Geo-informatics & Nano Technology for Precision Farming, SR Reddey, Kalyani Publications**

PLANT PATHOLOGY

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Fundamentals of Plant Pathology**	4 (3+1)	50	20	30	II

Theory

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases due to abiotic causes.

Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.

Bacteria and mollicutes: general morphological characters. Basic methods reproduction.

Viruses: Nature of properties structure, and transmission.Study of phanerogamic plant parasites.

Nematodes: General morphology and reproduction of nematodes. Defense mechanism in plants. Epidemiology: Factors affecting disease development.

Practical

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

Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting.

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

Related Books

1. Botany for Degree Students (The Fungi)- B.R. Vastistha.
2. Padap Rog Vigyan- B.P. Singh.
3. Introductory Mycology- C.J. Acexopoules, C.W. Mimes & M. Blackwell.
4. Plant Pathology- G.N. Agrios.
5. Plant Pathology- R.P. Singh.
6. Physiology of Fungi- Bilgrami.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Principles of Integrated Disease Management**	2 (1+1)	50	20	30	III

Theory

Categories of diseases, IDM: Introduction, history, importance, concepts, principles and tools of IDM, social and legal implication of IDM. Economic importance of, diseases and Methods of detection and diagnosis of and diseases. Methods of plant disease control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Forecasting of plant diseases. Safety issues in fungicide uses. Political,.

Practical

Methods of diagnosis and detection of, plant diseases, measurement plant disease intensity, Assessment of crop yield losses, Identification of biocontrol agents, Mass multiplication of *Trichoderma, Pseudomonas*, etc.

Related Books

1. Principles of Plant Pathology- R.S. Singh.
2. Introductory Plant Pathology- D.P. Tripathi.

3. Plant Pathology- P.D. Sharma.
4. Plant Pathology- R.S. Mehrotra.
5.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Diseases of Field & Horticultural Crops & their Management-I**	3 (2+1)	50	20	30	V

Theory

Study of fungicides and their formulations.

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, Sorghum: smuts, Bajra :green ears mildew and ergot; Groundnut: early and late leaf spots, (tikka disease)

and mosaic; Pigeonpea: blight, wilt and sterility mosaic; green gram: Cercospora leaf spot web blight; Tobacco: mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top;Papaya: foot rot, leaf curl; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot; Tomato: early and late blight, buck eye rot and leaf curl; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight;

Practical

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

Related Books

1. Plant Disease- R.S. Singh.
2. Diseases of Crop Plants in India- G. Rangaswami & A. Mahadevan.
3. Diseases of Vegetable Crops- R.S. Singh.
4. Padap Rog Vigyan- B.P. Singh.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Diseases of Field & Horticultural Crops & their Management-II**	3 (2+1)	50	20	30	VI

Theory

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

Field Crops:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, and ear cockle;

Sugarcane: red rot, smut, wilt, grassy shoot,

Sunflower: Sclerotinia stem rot; Mustard:, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, and Ascochyta blight; Lentil: rust and wilt; Pea: downy mildew, powdery mildew and rust.

Horticultural Crops:

Mango: anthracnose, malformation, and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew; Apple: scab.

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

Practical

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

Note: Students should submit 50 pressed and well-mountedspecimens.

Related Books

1. Plant Disease- R.S. Singh.
2. Diseases of Crop Plants in India- G. Rangaswami & A. Mahadevan.
3. Diseases of Vegetable Crops- R.S. Singh.
4. Padap Rog Vigyan- B.P. Singh.
5. Diseases of Fruit Crops- R.S. Singh.
6. Fungicides in Plant Disease Control- A.S. Singh.

HORTICULTURE

2S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Fundamentals of Horticulture**	2 (1+1)	50	20	30	I

Theory

Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; use of plant bioregulators in horticulture, irrigation and fertilizers applications – method and quality.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation Layout and planting or orchard plants. Training and pruning of fruit trees transplanting and care of vegetable seedlings making of herbaceous and shrubbery borders. Preparation of potting mixture potting and repotting. Fertilizer application in different crops. Visits to commercial nurseries/orchard.

Related Books

1. Fundamentals of Horticulture- J.B. Edmond, T.L. Senn, F.S. Andrews Publisher: Tata McGraw Hill Publishing Company Ltd.
2. Fundamentals of Fruit Production- V.R. Gardener, F.C. Bradford & H.D. Hooker, Publisher: McGraw Hill Book Company, Inc.
3. Introduction to Horticulture- E.P. Christopher. McGraw Hill Book Company, Inc.
4. Principles of Horticulture- Ervin L. Denisen, Publisher: The Memillan Company, New York.
5. Fruit Growing in India by W.B. Hayes, Publisher: Kitabistan, Allahabad.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	**Production Technology for Vegetable and Spices**	2 (1+1)	50	20	30	II

Theory

Importance of vegetables & spices in human nutrition and national economy, types of vegetable gardening brief about origin, area, production improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting storage, physiological disorders, disease and seed production of important vegetable and spices i.e. condiments, Ginger, turmeric, coriander, cumin, funnel, black peeper, ilaichi.

Practical

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

Related Books:

1. Vegetable Crops- Vol I. Edited by T.K. Bose, Publisher: Naya Prakashan, Kolkata.
2. Vegetable Crops- Vol II. Edited by T.K. Bose, Publisher: Naya Wdyog 206, Bidhan Sarani, Kolkata.
3. Vegetable Crops: Hower C. Thompson, William C. Kelly, Publisher: McGraw Hill Book Company, Inc., New York.
4. Vegetable Crops in India: P.C. Das, Publisher: Kalyani Publishers.
5. Vegetables: Biswajit Chaudhary, Publisher, NBT, India.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Production Technology for Ornamental Crops, MAPs and Landscaping**	2 (1+1)	50	20	30	IV

Theory

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers. Style of gardening and lawn making and maintenance. Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids user protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions. isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, geranium, vetiver.

Practical

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers extraction of essentials oils.

Related Books:

1. Sobhakar Udyan, Dr. Santram, Publisher: G.B. Pant Universtiy of Agriculture and Technology, Pant Nagar, 263145.
2. Introduction to Ornamental Horticulture, J.S. Arora, Publisher: Kalyani Publishers, New Delhi.
3. Floriculture in India, G.S. Randhava and G. Mukhopadhyay, Publisher: Allied Publishers Pvt. Ltd., Lucknow.
4. Gardening in India, Edited By T.K. Bose and D. Mukherjee, Publisher: Oxford & IBH Publishing Co. Pvt. Ltd.
5. Some Beautiful Indian Climbers & Shrubs, N.L. Bor & M.B. Raizada, Publisher: The Bombay Natural History Society, 114 A, Street.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Production Technology for Fruit and Plantation Crops**	2 (1+1)	50	20	30	V

Theory

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrcus, grape, guava, Litchi, papaya, apple, pear, peach and; minor fruits-pineapple, pomegranate, jackfruit, strawberry, nut crops; plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

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

Related Books:

1. A Textbook on Pomology (Temperate Fruits) Vol-IV, T.K Chattopadhyay, Publisher: Kalyani Publications.
2. A Textbook on Pomology (Subtropical Fruits) Vol-III, T.K. Chattopadhyay, Publisher: Kalyani Publications.
3. Fruit Growing in India, W.B. Hayes, Publisher: Kitabistan, Allahabad.
4. Fruits Tropical & Subtropical- Vol II, Edited T.K. Bose, Publisher: Naya Udyog, Kolkata.
5. Handbook of Horticulture, K.L. Chadha, Edited. Publisher: ICAR, New Delhi.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
5	**Post-harvest Management and Value Addition of Fruits and Vegetables**	2 (1+1)	50	20	30	VI

Theory

Importance of fruits and vegetables, extent and possible causes of post harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; role of ethylene; post harvest disease and disorders; heat, chilling and freezing injury; harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning — Concepts and Standards, packaging of products.

Practical

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

Related Books:

1. Principles & Practices of Post Harvest Technology, P.H. Pandey. Publisher: Kalyani Publications.
2. Preservation of Fruits & Vegetables, Girdhari Lal, G.S. Siddappa and G.L. Tandon, Publisher: ICAR, New Delhi.
3. Fal Parikshan, Dr. Shyam Sundar Srivastava, Publisher: Kitab Mahal, Allahabad.
4. Fal Tarkari Parikshan Prodhyogiki, S. Sadashiv Nayar and Dr. Harish Chandra Sharma, Publisher: Rajasthan Hindi Granth Academy, Jaipur.
5. Falo evam Sabjiyo ka Parikshan, Dr. Dalal Singh Khurdiya, Publisher: ICAR, New Delhi.
6. Basics of Food Technology and Nutrition, By Surya Narayan & Sheetla Prasad Verma, Publisher: Kulbhaskar Ashram P.G. College, Allahabad.
7. Practical Aspects of Food Technology & Nutrition Science, By Surya Narayan & Sheetla Prasad Verma, Publisher: Kulbhaskar Ashram P.G. College, Allahabad

AGRICULTURAL EXTENSION & COMMUNICATION

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Fundamentals of Agricultural Extension Education**	3 (2+1)	50	20	30	I

Theory

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (ADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition. concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods. ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Practical

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

Related Books

1. Fundamentals of Extension Education and Management in Extension by K.A. Jalihal and V. Veerabhadraiah. Publisher- concept publishing company, New Delhi.
2. Agricultural Extension by A.W. Vanden Banand, H.S. Hawkins, Publisher- CBS Publishers & distributors Pvt. Ltd., New Delhi.
3. Dimensions of agricultura. extension by A.K. Singh and Lakhan Singh, Publisher- Aman publishing house Meerut.
4. Handbook of Extension Education by O.S. Rathore, S.D. Dhakar, M.S. Chauhan and S.N.Ojha, Publisher- A grotech Publishing Academy, Udaipur.
5. Animal Husbandry Extension Education by P Mathiyalagan, Publisher- Department of Extension Education, Veterinary College, TNVASU

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	**Rural Sociology & Educational Psychology**	**2 (2+0)**	**80**	**20**	**00**	**II**

Theory

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

Related Books:

1. Text Book of Rural Sociology and Educational Psycology By Sagar Mondal, Publisher- Kalyani Publisher, New Delhi.
2. Understanding group dynamics by Donelson R. Forsyth, 5th edition, Publisher- Cengage India Publishers.
3. Dimensions of agricultural extension by A.K. Singh and Lakhan Singh, Publisher- Aman Publisheing House, Meerut.
4. Introductory Rural Sociology by J.B. Chitambar, Publisher- New Age International (P) Limited Publisher, New Delhi.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Entrepreneurship Development and Business Communication**	**2 (1+1)**	**50**	**20**	**30**	**IV**

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

Practical

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

Related Books:

1. Entrepreneurship development and Management by Prof. S Bhaskaran, Publisher- Aman Publishing House, Meerut.
2. Textbook of Entrepreneurship and Rural Development by Sagar Mondal and G.L. Ray, Publisher- Kalyani Publishers, New Delhi.
3. Entrepreneurship of small scale industries by M.V. Deshpandey Publisher- Deep and Deep Publisher, New Delhi.

4. Dimensions of agricultural extension by A.K Singh and Lakhan Singh, Publisher- Aman Publishing House, Meerut.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Communication skills and Personality Development**	**2 (1+1)**	**50**	**20**	**30**	**V**

Theory

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

Practical

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

Related Books:

1. Extension Communication and management by G.L. Ray, Publisher- Kalyani Publisher, New Delhi.
2. Dimensions of agricultural extension by A.K. Singh and Lakhan Singh, Publisher- Aman publishing house, Meerut.
3. Education and Communication for Development by O.P. Dahama and Bhatnagar, Publisher- Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

SOIL CONSERVATION

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Introduction to Forestry**	2 (1+1)	50	20	30	I

Theory

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; measurement of volume of felled and standing trees, age determination of trees. Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Practical

Identification of tree-species. Diameter measurements using calipers and tape, Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

Related Books

1- Introduction of Forestry - S.R Reddy & C. Nagmani Kalyani Publishers Ludhiana
2- Forests and Forestry- K.P Sagriya National Book Trust of India New Delhi
3- Introduction to social Forestry- M. Sitaram Rao Oxford and IBH Publishing Co.Pvt.ltd. New Delhi

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	**Environmental Studies and Disaster Management**	2 (1+1)	50	20	30	III

Theory

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, b) Water resources: Use and over-utilization of surface and ground water, floods, drought, dams-benefits and problems. c) d) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

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: - 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. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Social Issues and the Environment: Water conservation, rain water harvesting, watershed management. climate change, global warming, acid rain, ozone layer depletion, 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. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

Disaster Management

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, landslides, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.

Man Made Disasters- Nuclear disasters, biological disasters, forest fire, pollution, water pollution, deforestation, industrial waste water pollution.

Disaster Management- level.

Practical

Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site-Urban/Rural/Industrial/Agricultural, study of simple ecosystems-pond, river, hill slopes, etc.

Related Book

1- Environmental Science and Agro-Ecology- Dr. S.P Singh & Dr. M.V.S Reddy Aman Publication House Meerut.
2- Ecology and Environment- P.D Sharma Rastogi Publication Meerut.
3- Environmental Geography- Savindra Singh Prayag Pustak Bhavan Allahabad.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Introductory Agro-meteorology & Climate Change**	2 (1+1)	50	20	30	IV

Theory

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting-types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

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

Related Book

1- Agriculture Metrology And Climate Change- Dr. R.P.S Dheewan Rama Publishing House Meerut.

2- Geography- Savindra Singh Prayag Pustak Bhavan Allahabad

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	**Watershed and wasteland Management**	2 (1+1)	50	20	30	VI

Theory

Watershed management - Concept need, principles & components of watershed management integrated watershed management. Factors effecting watershed management runoff & soil loss management in a watershed socio-economic concept of watershed. Peoples participation in watershed management. Policy approaches & management plan, problems of watershed management.

Wasteland management - Definition, concept & types of degraded & wasteland. Distribution & extent of watershed in India & Uttar Pradesh, factors responsible for land degradation, characteristics of different types of degradation & wasteland. Problems of degraded land in Uttar Pradesh. Appropriate techniques for management of different types of degraded & wasteland. Practical:.

Practical

Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

Related Books

1- Wasteland Management and Environment- A.K. Roy & S.K. Verma (Ed.) Publisher: Scientific Publishers

3. Integrated Watershed Management- Isobel W. Heathcote, Isabel Heathcote Publisher John Wiley and Sons.
4. Watershed Management by Madan Mohan Das, Mimi Das Saikia PHI Publisher

ANIMAL HUSBANDRY AND DAIRY SCIENCE

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	INTRODUCTORY ANIMAL HUSBANDRY	2 (1+1)	50	20	30	I

UNIT 1.
GENERAL: Importance of livestock in Agriculture and economy. Dairying under specialized and mixed farming. Livestock and milk production statistics.
UNIT 2.
DAIRY CATTLE AND BUFFALOES MANAGEMENT: Cattle and buffalo Breeds, Breeding methods and systems, Care and management of pregnant and milch cows, Raising of calves, Management of heifers and bulls, Maintenance of livestock records, Milking methods and principles. Clean milk production, Feeds and feeding, Conservation of fodder, Housing for dairy animals.
UNIT 3.
PIG MANAGEMENT; Importance, Important breeds, Raising of piglets up to age of slaughter, General aspects of breeding, Care of sow and boar.
UNIT 4.
SHEEP AND GOAT MANAGEMENT: Importance, Important breeds, Raising of kids and lambs, Breeding, Feeding of goats and sheep.
UNIT 5.
HEALTH MANAGEMENT: Common animal diseases of cattle, buffalo, goat, sheep and swine viz. Anthrax, BQ, HS, Brucellosis, Mastitis, Swine fever and Enterotoximea. Vaccination schedule.

Practical
Study of external body parts, Study of phenotypic and physiological difference between cow and buffaloes, Estimation of body weight by measurements, Identification of animals, Castration, Dehorning, Estimation of cost of milk production, Problems on computation of ration, Casting and throwing, Grooming, Scheme of fodder production round the year, Recording temperature, pulse rate and respiration rate of animals.

Related Books

(1) NSR., Sastry, C.K. Thomas : Livestock Production Management 2015, Kalyani Publications, Ludhiyana.
(2) Dr. Sheetla Prasad Verma, Pashu Prajanan, 2014, Lok Sahitya Prakashan, Allahabad.
(3) B.S. Tomer, Textbook of Animal Breeding, 2004, Kalyani Publishers, Ludhiyana.
(4) Dr. Sheetla Prasad Verma, Animal Welfare, 2018, First Print Publications, Allahabad.
(5) Dr. Jagdish Prasad, Animal Husbandry and Dairy Science, 2014, Kalyani Publishers, Ludhiyana.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	POULTRY PRODUCTION AND MANAGEMENT	2 (1+1)	50	20	30	II

UNIT 1.
GENERAL: Importance of poultry industry in India, Poultry production and marketing statistics of eggs and chicken. Historical development in poultry birds potential.
UNIT 2.
BREEDING: Male and female reproductive system of chicken, Breeds and strains of broilers and layers of chicken, duck and quails, General aspects of breeding for better egg production and body weight gain, Selection and culling, Artificial insemination

UNIT 3.
GENERAL MANAGEMENT: Establishment of poultry farm, Housing and equipment, Incubation and hatching of eggs, Broiler and layer management, Lighting schedule for poultry.
UNIT 4.
FEEDS AND FEEDING: Digestion, Digestive system of chicken, Feed ingredients, Availability of CP and ME in ingredients, Feed processing, Formulation of feed viz. Starter, Grower, Layer, Finisher and Breeder ration, FCR, CP ratio, Nutritional deficientic conditions.

UNIT 5.
HEALTH MANAGEMENT: Vaccination schedule for poultry, Common poultry diseases, i.e. Ranikhet, Marex, Chicken pox, Gumboro, Infectious bronchitis and CRD, Control of internal and external parasites.
UNIT 6.
POULTRY PRODUCTS: Preservation and storage of eggs, Grading of eggs, AGMARK standard of egg, Egg powder, Slaughtering and processing of chicken, Marketing of poultry products.
Practical:
Neat and clean diagram of hen showing external body parts, Structure of egg, Formulation of ration viz. Broiler starter ration, Broiler finisher ration, Chick starter ration, Grower ration, Layer ration and Breeder ration. Vaccination schedule for broiler and layers. Debeaking, Candling of eggs, Dissection of bird for showing internal body parts.
Related Books:

(1) Dr. Sheetla Prasad Verma, Poultry Production Management, 2018, First Print Publications, Allahabad.
(2) R.A. Singh, Poultry Production, 2016. Kalyani Publishers, Ludhiyana.
(3) H.C. Saxena, E.H. Ketelars, Poultry Production in Hot Climates, 2008, Kalyani Publishers, Ludhiyana.
(4) Amlendu Chakrabarti, Practice of Poultry Medicine, 2010, Kalyani Publishers, Ludhiyana.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	DAIRY SCIENCE	2 (1+1)	50	20	30	III

UNIT 1.
GENERAL: Concept of Dairying, Dairying in India, Dairy Development in Different five year plans.
UNIT 2.
Dairy production statistics.
UNIT 3.
Dairy cooperatives, Functioning of dairy cooperatives societies, Functioning of Anand Pattern, White revolution, Objectives and achievements of operation flood.
UNIT 4.
Transportation and milk distribution, Pricing policy of milk, Platform tests, Filteration, Straining and Clarification of milk, Standardization, Milk adulteration and its detection, Common preservatives of milk and their detection, Legal standards of milk.
UNIT 5.
Introduction with indigenous dairy products viz. Dahi, Khoa, Chhena, Paneer, Kheer, Lassi, Rabri, etc.
Practical:
1. Sampling of milk.
2. C.O.B. Test.
3. M.B.R. Test.
4. Sediment Test.
5. Problems on Standardization.
6. Detection of adulterants viz. water, starch, sucrose and urea.

7. Problems on adulteration
8. Hansa test
9. Detection of preservatives

Related Books:

(1) Sukumar De, Outlines of Dairy Technology, Oxford University Press.
(2) Dr. Sheetla Prasad Verma, Dugdh Evam Dugdh Utpad 2012, Uttar Pradesh Hindi Sansthan, Lucknow.
(3) Dr. Sheetla Prasad Verma, Dugdh Evam Dugdh Utpad, 2009, Prabhi Publications, Mayur Vihar, Delhi

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	PRINCIPLES OF FOOD SCIENCE AND NUTRITION	2 (1+1)	50	20	30	IV

UNIT 1.
GENERAL: Definition of food and food science, Composition of food, Foods of animal origin.
UNIT 2.
Definition, Chemistry, and Metabolism of carbohydrate, fat, proteins and water.
UNIT 3.
Requirement, Availibility and functions of minerals and vitamins. Flavours and colors used in food.
UNIT 4.
Food microbiology with special reference to milk, Physcio chemical properties of milk.
UNIT 5.
Composition and processing of egg, meat and chicken, Nutritional disorders and deficiency disease, malnutrition (over and under nutrtion), feed additives.

Practical:

1. Sampling of milk.
2. Specific gravity of milk.
3. Acidity of milk.
4. Water Quality test.
5. Sediment Test.
6. Study of Nutritional deficientic conditions.
7. Study of Nutritional disorders.
8. Quality parameters for egg, meat and chicken.

Related Books:

(1) Surya Narayan, Sheelta Prasad Verma, Basics of Food Technology and Nutritional Science 2011, Kulbhaskar Ashram P.G. College, Allahabad.
(2) Surya Narayan, Sheelta Prasad Verma, Practical Aspects of Food Technology and Nutritional Science, 2011, Kulbhaskar Ashram P.G. College, Allahabad.
(3) Jagdish Prasad, Principles and Practices of Livestock Product Technology, 2015, Kalyani Publishers, Ludhiyana.
(4) Vijay Khader, Textbook of Food Science and Technology 2016, ICAR, New Delhi-12

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
5	FOOD PROCESSING AND SAFETY ISSUES	2 (1+1)	50	20	30	V

UNIT 1.

GENERAL: Definition of food, Constituents of foods: water, carbohydrate, fat, protein, vitamins and minerals with reference to milk, Detailed composition of milk and colostrum.

UNIT 2.

FOOD PROCESSING: Pasteurization, Sterilization, Bactofugation, Uperization, and Homogenization of milk, Neutralization of milk cream, Cooling and chilling of milk.

UNIT 3.

Manufacturing of common dairy products viz. Cream, Butter, Ghee, Dahi, Ice-cream, Malai burf and Kulfi.

UNIT 4.

Manufacturing of Khoa, Evaporated milk, Condensed milk, WMP, SMP, Paneer, Cheese, and Chhena.

UNIT 5.

FOOD SAFETY: Definition, Importance, Scope. Hazards and risks. Food safety management, HACCP, ISO Series, TQM- Concept and need for quality component of TQM, Basic water tests.

Practical:

Preparation of indigenous dairy products viz. Dahi, Chhena, Khoa, Paneer, Cream, Ghee, Kulfi. Water quality analysis. Problem on neutralization of milk and cream. Preparation of plants for implementation of HACCP and ISO series, problems on over run

Related Books:

(1) Sukumar De, Outlines of Dairy Technology, Oxford University Press.
(2) Dr. Sheetla Prasad Verma, Dugdh Evam Dugdh Utpad 2012, Uttar Pradesh Hindi Sansthan, Lucknow.
(3) Dr. Sheetla Prasad Verma, Dugdh Evam Dugdh Utpad, 2009, Prachi Publications, Mayur Vihar, Delhi.
(4) Outlines of Dairy Technology, Sukumar De, Oxford University Press.
(5) Food Science And Technology- Vijay Khadar ICAR Publication New Delhi

ENGLISH

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	**Comprehension and Communication Skills In English**	2 (1+1)	50	20	30	I

Theory

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

Practical

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

Related Books:

1- Spoken English, V. Sasikumar and P.V. Dhamija, Tata McGraw Hill Publishing Company Limited, New Delhi.

2- Glimpses of English Prose, O.P. Dixit, Sahitya Niketan. Kanpur.

STATISTICS, COMPUTER APPLICATION AND IPR

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	Statistical Methods	2 (1+1)	50	20	30	III

Theory

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

Practical

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

Related Books:

1. Fundamentals of Mathematical Statistic, S.C. Gupta & V.K Kapoor: S. Chand & Sons, New Delhi.
2. Fundamentals of Applied Statistics. S.C. Gupta & V.K. Kapoor: S. Chand & Sons, New Delhi.
3. Design Analysis of Experiment, Das & Giri, New Age International Publisher, New Delhi.
4. Sampling Theory of Surrey, Sukhatme & Sukhatme.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	Agri-Informatics	2 (1+1)	50	20	30	IV

Theory

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

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

Practical

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

Related Books:

1- Fundamentals of computers – P.K Sinha BPB Publication
2- MS Office 2010- Satish Jain BPB Publication
3- Decision support system- V.S Jankiraman & K. Sarukesi PHI Publication

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Intellectual Property Rights**	2 (1+0)	80	20	00	V

Theory

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

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

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

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

REMEDIAL COURSES

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	Agricultural Heritage	1 (1+0)	80	20	00	I

Theory

Introduction of Indian agricultural heritage: Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	General Agriculture-I	1 (1+0)	80	20	00	I

Soil Conservation:

Climate and weather, elements of weather; Rainfall, temperature, humidity, wind, sunshine, climate change and global warming. Soil erosion and soil conservation. Reclamation of problematic soils: acidic and alkali.

Genetics and Plant Breeding

Cell and its structure, cell division-mitosis and their significance in plant growth and development. Introduction to DNA, RNA and their differences. Role of Genetics in Plant Breeding. Self and cross pollinated crops, methods of breeding in field crops, introduction, selection, hybridization and mutation. Mendel's laws of inheritance. Illustrative depiction of the experiments, their importance in plant breeding.

Agricultural Engineering

Important farm implements and their maintenance.

Plant Pathology

Definition of Plant Pathology and its importance. Diseases and classification of plant diseases according to their cause and occurrence. Symptom and preliminary knowledge of management of Plant diseases.

Dairy Science

Importance of livestock in Agriculture. Breeds : Exotic & Indigenous, LPM (Care and management of Calf, Heifer, Cow before and after calving), Animal nutrition (Feeds and feeding), Dairy Technology (Milk, milk processing and milk products), Common diseases of Animals and vaccinations.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	General Agriculture-II	1 (1+0)	80	20	00	I

Agronomy

Introduction of Agronomy:- Definition and scope; Classifications of crops-Seasonal and Agronomic/Economic classification; Tillage-Definition and Types; Crop rotation- Definition, principles and its importance. Basic knowledge about major crops of U.P. viz; Paddy, Maize, Pigeon pea, Gram, Pea and Mustard.

Agriculture Chemistry

Definition of soil, soil texture, structure and its type, distribution and area, saline-alkali soils, acid soils, characteristics and reclamation. Soil fertility, productivity, concept of essential plant nutrients and classification. Role of plant nutrients and their important deficiency symptoms. Soil sampling and its processing, Introduction of soil p^H, Ec and Organic Carbon. Introduction to manures and fertilizers, Bio-fertilizers, methods of application.

Horticulture

Introduction, distribution and economic importance of fruits: Mango, Banana, Guava, Lime, Grape, Apple, Pomegranate. Vegetables; Potato, Tomato, Cauliflower, Cabbage, Spinach, Brinjal, Bottle gourd, Pumpkin, Cucumber. Flower; Rose, Gladiolus, Marigold. Types of seed- Foundation and Certified. Methods of plant propagation; layering and cutting, and tissue culture.

Post harvest managements of fruits, vegetables and flowers. Principles and methods of preservation, benefits of preservations. Preparation of value added products i.e. Jam, Jelly, Ketchup, Morabba, Pickles and Marmalade.

Agricultural Economic

Scope of Agriculture in National economy and employment. Agricultural economics-Basic concepts (Goods, Services, Wants, Supply Demand and Utility) and definitions. Cooperative system in Agriculture (Principles, definition and motto with examples). Crops insurance, KCC, marketing of Agricultural Product (supply chain, retailing, wholesale) haats.

Agricultural Zoology and Entomology

Definition of Entomology and its importance. Branches of Entomology. General characters of insect. Metamorphosis and types of metamorphosis.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	Introductory Biology	1 (1+0)	80	20	00	I

Theory

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division. Morphology of flowing plants. Seed and seed germination. Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
5	Elementary Mathematics	1 (1+0)	80	20	00	I

Theory

Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2,y_2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n , e^x , sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$ (Simple problems based on it).

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

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

NON-GRADIAL COURSES

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
1	NSS	2 (0+2)	00	100	00	1

Introduction and basic components of NSS:
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, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change

Community mobilization
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

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
2	National Cadet Corps	2 (0+2)	00	100	00	I

1. Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline.
2. Drill- aim, general words of command, attention, stands at ease, stand easy and turning.
3. Sizing, numbering, forming in three ranks, open and close order march and dressing.
4. Saluting at the halt, getting on parade, dismissing and falling out.
5. Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.
6. Turning on the march and wheeling. Saluting on the march.
7. Marking time, forward march and halt.
8. Changing step, formation of squad and squad drill.
9. Command and control, organization, badges of rank, honours and awards
10. Nation Building- cultural heritage, religions, traditions and customs of India. National integration.
11. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.
12. Leadership traits, types of leadership. Character/personality development.
13. Civil defense organization, types of emergencies, fire fighting, protection,

14. Maintenance of essential services, disaster management, aid during development projects. 15. Basics of social service, weaker sections of society and their needs, NGO's and their contribution, contribution of youth towards social welfare and family planning.
16. Structure and function of human body, diet and exercise, hygiene and sanitation.
17. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health
18. Adventure activities
19. Basic principles of ecology, environmental conservation, pollution and its control.
20. Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self defense.

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	**Physical Education and Yoga Practices**	2 (0+2)	00	100	00	I

1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. 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 – 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 advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas – demonstration, practice, correction and practice
13. Teaching of some more of Asanas – demonstration, practice, correction and practice
14. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
15. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
16. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
17. Teaching – Meaning, Scope and importance of Physical Education
18. Teaching – Definition, Type of Tournaments
19. Teaching – Physical Fitness and Health Education
20. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).
1. Teaching of skills of Hockey – demonstration practice of the skills and correction.
2. Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation
3. Teaching of advance skills of Hockey – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
4. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction.

5. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of the skills in games situation
6. Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
7. Teaching of different track events – demonstration practice of the skills and correction.
8. Teaching of different track events – demonstration practice of the skills and correction.
9. Teaching of different track events – demonstration practice of the skills and correction with competition among them.
10. Teaching of different field events – demonstration practice of the skills and correction.
11. Teaching of different asanas – demonstration practice and correction.
15. Teaching of weight training – demonstration practice and correction
19. Teaching of circuit training – demonstration practice and correction
20. Teaching of calisthenics – demonstration practice and correction.

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

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
3	Human Value and Ethics	1 (0+1)	00	100	00	II

Theory

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

S.No	Title	Credit	Marks Distribution			Semester
			T	I	P	
4	Educational Tour	2 (0+2)	00	100	00	VI

At least 4 days educational tour to any Agriculture related Place/Agriculture University/ICAR Institution/Agriculture Farm. Report submission

ELECTIVE COURSES

1. Agri-businessManagement 3(2+1)

Theory

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

Practical

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

2. Agrochemicals 3(2+1)

Theory

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

Herbicides-Major classes, properties and important herbicides. Fate of herbicides.

Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride.

Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb.

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

Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassiumchloride, potassium sulphate and potassium nitrate.

Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing.

Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available kin market. Estimation of nitrogen in Urea. Estimation of water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

3. Commercial Plant Breeding 3(1+2)

Theory

Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production. Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical

Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. Visit to public private seed production and processing plants.

4. Landscaping 3(2+1)

Theory

Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

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

5. Food Safety and Standards 3(2+1)

Theory

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

Practical

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

6. Course title: Biopesticides & Biofertilizers 3(2+1)

Theory

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.

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

Practical

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

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

7. Protected Cultivation 3(2+1)

Theory

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management.

Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Practical

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

8. Hi-tech. Horticulture 3(2+1)

Theory

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods, Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding, Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

9. Weed Management3(2+1)

Theory

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Practical

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agro-chemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

10. System Simulation and Agroadvisory 3(2+1)

Theory

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

Practical

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

11. Agricultural Journalism 3(2+1)

Theory

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism. Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines. The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources. Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

Practical

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.

12. Composite Fish cum Duck/ (and) Quail/ (and) Rabbit culture.

Fishery: Definition, common characteristics and position of fish in Animal Kingdom, fishery statistics preparation and management of fish pond, physical and chemical condition of water for fishery, feeds and feeding of fishes, breeding of fish, diseases and enemies of fishes, use of Duck/quality beats on fish feeds.

Duck Culture: Definition, common features and advantages, breeds, incubation and hatching feeding of ducks, care and managements of ducking, grower, layer/broiler ducks. Characteristics of duck eggs, common diseases and vaccination schedule, duck culture statistics.

Quail: Definition, common features of quail farming, advantages, breeds, incubation and hatching, feeding of quails, care and managements of quail chick, grower/layer/broilers. Quail product technology, common diseases and vaccination schedule.

Rabbit culture : Introduction, scope and advantages of rabbit farming, breeds, breeding, housing, care and management of young and adult rabbit, feeds and feeding for rabbits, common problems of rabbit culture including vaccination schedule, fur and meat production technology.

Practical:

1. Fishery units, visit, Demonstration and report formulation.
2. Different type of fishes, deep water, middle water, and surface water.
3. Evaluation of Duck Egg (candling) and Grading.
4. Vaccination schedule for duck and Quail.
5. Preparation Ration for Duck, Quail, Rabbit and Fish.
6. Preparation of different products from eggs.

Related Books:

1- Fishery cum Duck culture, Dr. S. P. Verma, First Print Publications, Prayagraj.
2- Battakh Palan Evam Bater Palan, Dr. Sheetla Prasad Verma, GH Publications, Prayagraj.
3- Khargosh Palan, Dr. S. P. Verma, GH Publications, Prayagraj.