Name of degree: B. Sc. (Ag.) Hons.

Examination and Evaluation System*

The Committee recommends Uniform Grading system to be followed with uniform OGPA requirements for award of degrees at all levels and uniform conversion formulae to be followed for declaration of I, II and III divisions, distinctions etc. Declaration of division in the degree certificate to be made compulsory by all universities:

1. Examination

External theory (50%)

Internal Theory + Practical (50%)

- **Courses with Theory and Practical**

  Mid-term Exam (30%) + Assignment (5%) in practical oriented courses + Practical (15%)

- **Courses with only Theory**

Mid-term Exam (40%) + Assignment (10%)

- **Courses with only Practical**

(100%) Internal

- ✓ Paper to be set by external: HOD shall ensure the coverage of syllabus. If needed moderation can be done.
- ✓ Evaluation of the answer sheet of final and practical examination will be done as per the guideline of Lucknow University, Lucknow.

2. Evaluation

Degree	Percentage of Marks Obtained	Conversion into Points
All	100	10 Points
	90 to <100	9 to <10
	80 to <90	8 to <9
	70 to <80	7 to <8
	60 to <70	6 to <7
	50 to <60	5 to <6
	<50 (Fail)	<5
	Eg. 80.76	8.076
	43.60	4.360
	72.50 (but shortage in attendance)	Fail (1 point)

*Syllabus as per ICAR Vth Dean Committee report has been little bit modified in view of local/specific needs of the area as per guidelines of ICAR, New Delhi

OGPA	Division
5.000 – 5.999	Pass
6.000 – 6.999	II division
7.000 – 7.999	I division
8.000 and above	I division with distinction

GPA = Total points scored / Total credits (for 1 semester)

CGPA = Σ Total points scored / Course credits

OGPA = Σ Total points scored (after excluding failure points)/ Course credits

% of Marks = OGPA x 100/10

DISCIPLINE-WISE SUMMARY OF CREDIT HOURS

Sl. No.	Group	Credits
1.	Agronomy	22(12+10)
2.	Genetics & Plant Breeding/ Physiology/ Environmental Sciences/Bio-technology	23(15+8)
3.	Soil Science & Agricultural Chemistry	8(6+2)
4.	Entomology	9(6+3)
5.	Agricultural Economics	10 (7+3)
6.	Agricultural Engineering	8(4+4)
7.	Plant Pathology/ Microbiology	15(10+5)
8.	Horticulture/ Introduction to Forestry	13(7+6)
9.	Agricultural Extension	9(6+3)
10.	Statistics, Computer Application and I.P.R.	5(3+2)
11.	Animal Production	6 (5+1)
12.	English	2(1+1)
13.	Remedial Courses	02 (Bio/Math) 01 (Agri.)
14.	NSS/Physical Education & Yoga Practices** (First Semester)	1(0+1)
15.	Human Values and Ethics**	1(1+0)

16.	Educational Tour**	2(0+2)
17.	Elective courses	9
Total		126+2+1+5+9 Elective courses
RAWE **ELP**		20+20
Grand Total		**146+20+20=186**
****Non-gradial courses**		

SEMESTER-WISE DISTRIBUTION OF COURSES

I-semester

Sl. No.	Course code	Course title	Credit hours
1.	AGRO-111	Fundamentals of Agronomy	4(3+1)
2.	HORT-111	Fundamentals of Horticulture	2 (1+1)
3.	SS-111	Fundamentals of Soil Science	3(2+1)
4.	GPB-111	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
5.	EXT-111	Rural Sociology & Educational Psychology	2 (2+0)
6.	HORT-112	Introduction to Forestry	2 (1+1)
7.	ENG-111	Comprehension & Communication Skills in English	2 (1+1)
8.	GPB-112/ MATH-111	Introductory Biology/ Elementary Mathematics	2 (1+1)/ 2(2+0)*
9.	AGR-111	Agricultural Heritage	1(1+0)*
10.	NSS/PEYP	NSS/Physical Education & Yoga Practices	1(0+1)**
Total			**22(18+3*+1**)**
***Remedial course**		** **Non-gradial courses**	

II-semester

Sl. No.	Course code	Course title	Credit hours
1.	GPB-121	Fundamentals of Genetics	3(2+1)
2.	GPB-122	Fundamentals of Crop Physiology	2(1+1)
3.	AECO-121	Fundamentals of Agricultural Economics	2(2+0)

4.	PATHO-121	Fundamentals of Plant Pathology	4(3+1)
5.	ENT-121	Fundamentals of Entomology-I (Insect Morphology and Taxonomy)	2(1+1)
6.	EXT-121	Fundamentals of Agricultural Extension Education	3(2+1)
7.	PATHO-122	Agricultural Microbiology	2(1+1)
8.	AGENG-121	Soil and Water Conservation Engineering	2(1+1)
9.	HORT-121	Production Technology for Vegetables and Spices	2 (1+1)
10.	HVE-121	Human Values & Ethics (non-gradial)	1(1+0)**
Total			**23(22+1**)**
**** Non-gradial courses**			

III-semester

Sl. No.	Course code	Course title	Credit hours
1.	AGRO-211	Crop Production Technology – I *(Kharif Crops)*	3(2+1)
2.	GPB-211	Fundamentals of Plant Breeding	3(2+1)
3.	AECO-211	Agricultural Finance and Cooperation	3(2+1)
4.	COMP-211	Agri- Informatics	2(1+1)
5.	AGENG-211	Farm Machinery and Power	2(1+1)
6.	GPB-212	Environmental Studies and Disaster Management	3(2+1)
7.	STAT-211	Statistical Methods	2(1+1)
8.	AS-211	Livestock and Poultry Management	4(3+1)
9.	HORT-211	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
10	ENT-211	Fundamentals of Entomology-II (Insect Ecology and Concept of IPM)	2(1+1)
Total			**26**

IV-semester

Sl. No.	Course code	Course title	Credit hour
1.	AGRO-221	Crop Production Technology –II *(Rabi Crops)*	3(2+1)

2.	AGENG-221	Renewable Energy and Green Technology	2(1+1)
3.	SS-221	Problematic Soils and their Management	2(2+0)
4.	HORT-221	Production Technology for Fruit and Plantation Crops	2(1+1)
5.	GPB-221	Principles of Seed Technology	3(2+1)
6.	EXT-221	Communication Skills and Personality Development	2(1+1)
7.	ENT-221	Pests of Crops and Stored Grain and their Management	3(2+1)
8.	AECO-221	Agricultural Marketing Trade & Prices	3(2+1)
9.	AGRO-222	Introductory Agro-meteorology & Climate Change	2(1+1)
10.	EC	Elective course	3 credits
Total			**25**

V-semester

Sl. No.	Course code	Course title	Credit hours
1.	SS-311	Manures, Fertilizers and Soil Fertility management	3(2+1)
2.	PATHO-311	Diseases of Field and Horticultural Crops and their Management -I	3(2+1)
3.	GPB-311	Crop Improvement-I *(Kharif Crops)*	3(2+1)
4.	AGRO-311	Farming System & Sustainable Agriculture	1(1+0)
5.	EXT-311	Entrepreneurship Development and Business Communication	2(1+1)
6.	AGRO-312	Geoinformatics and Nano-technology and Precision Farming	2(1+1)
7.	AGRO-313	Practical Crop Production – I (*Kharif* crops)	2(0+2)
8.	AS-311	Principles of Food Science and Nutrition	2(2+0)
9.	IPR-311	Intellectual Property Rights	1(1+0)
10.	AGRO-314	Principles of Organic Farming	2(1+1)
11.	EC	Elective course	3 credits
Total			**24**

VI-semester

Sl. No.	Course code	Course title	Credit hours
1.	AGRO-321	Rainfed Agriculture & Watershed Management	2(1+1)
2.	AGENG-321	Protected Cultivation and Secondary Agriculture	2(1+1)
3.	PATHO-321	Diseases of Field and Horticultural Crops and their Management-II	3(2+1)
4.	HORT-321	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
5.	ENT-321	Management of Beneficial Insects	2(1+1)
6.	GPB-321	Crop Improvement-II *(Rabi crops)*	3(2+1)
7.	AGRO-322	Practical Crop Production –II (*Rabi* crops)	2(0+2)
8.	AECO-321	Farm Management, Production & Resource Economics	2(1+1)
9.	PATHO-322	Principles of Integrated Disease Management	3(2+1)
10.	ET-321	Education Tour	2(0+2)
11.	EC	**Elective Course**	**3 credits**
Total			**26**

VII-semester

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

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

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

RAWE Component-I

Village Attachment Training Programme

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

RAWE Component –II

Agro Industrial Attachment

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

Activities and Tasks during Agro-Industrial Attachment Programme

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

- Documentation of the activities and task performed by the students
- Performance evaluation, appraisal and ranking of students

VIII-semester

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

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

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**

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

Sl. No.	Course code	Courses	Credits
1.	AECO EC-01	Agribusiness Management	3(2+1)
2.	SS EC-01	Agrochemicals	3(2+1)
3.	GPB EC-01	Commercial Plant Breeding & Seed Industry	3(1+2)
4.	HORT EC-01	Landscaping	3(2+1)
5.	AS EC-01	Food Safety and Standards	3(2+1)
6.	ENT EC-01	Bio-pesticides & Bio-fertilizers	3(2+1)
7.	AGENG EC-01	Protected Cultivation	3(2+1)
8.	GPB EC-02	Micro propagation Technologies	3(1+2)
9.	HORT EC-02	Hi-tech. Horticulture	3(2+1)
10.	AGRO EC-01	Weed Management	3(2+1)
11.	AGRO EC-02	System Simulation and Agro-advisory	3(2+1)
12.	EXT EC-01	Agricultural Journalism	3(2+1)

DISCIPLINE-WISE CREDITS AND SYLLABUS

1. Agronomy

Sl. No.	Course code	Course title	Credit hours
1.	AGRO-111	Fundamentals of Agronomy	4(3+1)
2.	AGRO-222	Introductory Agro meteorology& Climate Change	2(1+1)
3.	AGRO-211	Crop Production Technology-I (Kharif Crops)	3(2+1)
4.	AGRO-221	Crop Production Technology-II (Rabi crops)	3(2+1)
5.	AGRO-311	Farming System and Sustainable Agriculture	1(1+0)
6.	AGRO-313	Practical Crop Production-I *(Kharif Crops)*	2(0+2)
7.	AGRO-322	Practical Crop Production-II *(Rabi Crops)*	2(0+2)
8.	AGRO-314	Principles of Organic Farming	2(1+1)
9.	AGRO-312	Geo-informatics, Nano-technology and Precision Farming	1(1+0)
10.	AGRO-321	Rainfed Agriculture and Watershed Management	2(1+1)
Total			**22(12+10)**

I. AGRO-111: Fundamentals of Agronomy 4(3+1)
Theory

Unit-I

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency,

Unit-II

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

Unit-III

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

Unit-IV

Growth and development of crops, factors affecting growth and development, plant ideotypes.

Unit-V

Crop rotation and its principles, adaptation and distribution of crops, crop management technologiesin problematic areas, harvesting and threshing of crops.

Practical

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

II. AGRO-222: Introductory Agro meteorology& Climate Change 2(1+1)

Theory

Unit-I

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables.

Unit-II

Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;

Unit-III

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

Unit-IV

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 rain making. Monsoon- mechanism and importance in Indian agriculture.

Unit-V

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. Change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

Visit of Agro-meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of albedo and sunshine duration. Measurement of maximum and minimum air temperatures, its tabulation. 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 ofatmospheric conditions. Measurement of wind speed and wind direction, preparation of windrose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapo-transpiration. Computation of PET and AET.

III. AGRO-211: Crop Production Technology-I (*Kharif* Crops) 3(2+1)

Theory

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

Unit-I

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

Unit-II

Pulses- pigeonpea, mungbean and urdbean.

Unit-III

Oilseeds- groundnut, and soybean;

UNIT - IV

Fibre crops- cotton & jute.

Unit-V

Forage crops-sorghum, cowpea, cluster bean and napier.

Practical

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

IV. AGRO-221: Crop Production Technology-II (Rabi crops) 3(2+1)

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield

Unit-I

Rabi crops; Cereals –wheat and barley.

Unit-II

Pulses-chickpea, lentil, peas,

UNIT - III

Oilseeds-rapeseed & mustard and sunflower; Sugar crops-sugarcane

Unit-IV

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

Unit-V

Forage crops-berseem, lucerne and oat.

Practical

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

V. AGRO-311: Farming System and Sustainable Agriculture 1(1+0)

Theory

Unit-I

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

Unit- II

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

Unit- III

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

Unit- IV

Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones.

Unit- V

Resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

VI. AGRO-313: Practical Crop Production-I *(Kharif Crops)* 2(0+2)

Practical

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

VII. AGRO-322: Practical Crop Production-II *(Rabi Crops)* 2(0+2)

Practical

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

8. AGRO-314: Principles of Organic Farming 2(1+1)

Theory

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

Practical

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

9. AGRO- 312: Geo-informatics, Nano-technology and Precision Farming 1(1+0)

Theory

Unit-I

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Uses of GIS, GPS &VRA in precision agriculture.

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

Practical

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

10. AGRO-321: Rainfed Agriculture and Watershed Management 2(1+1)

Theory

Unit-I

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India.

Unit-II

Problems and prospects of rainfed agriculture in India; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques.

Unit-III

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

Unit-IV

Water harvesting: importance, its techniques, efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions.

Unit-V

Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

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

2. Genetics& Plant Breeding/ Physiology/ Environmental Sciences/Bio-technology

Sl. No.	Course code	Course title	Credit hours
1.	GPB-121	Fundamentals of Genetics	3(2+1)
2.	GPB-221	Principles of Seed Technology	3(2+1)
3.	GPB-211	Fundamentals of Plant Breeding	3(2+1)
4.	GPB-311	Crop Improvement – I (Kharif)	3(2+1)
5.	GPB-321	Crop Improvement – II (Rabi)	3(2+1)
6.	GPB-212	Environmental Studies and Disaster Management	3(2+1)
7.	GPB-122	Fundamentals of Crop Physiology	2(1+1)
8.	GPB-111	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
Total			**23(15+8)**

I.GPB-121: Fundamentals of Genetics 3(2+1)

Theory

UNIT-I

Cell cycle and cell division- mitosis and meiosis. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance- Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics.

UNIT-II

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Dominance relationships, Epistatic interactions with example.

UNIT - III

Probability and Chi-square. Linkage and its estimation, crossing over mechanisms, chromosome mapping Sex determination and sex linkage, sex limited and sex influenced traits,

UNIT-IV

Multiple alleles, pleiotropism and pseudoalleles, Blood group genetics,. Mutation, classification, multiple factor hypothesis,, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations,

UNIT-V

Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation. Cytoplasmic inheritance. Genetic disorders.

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 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.

II. GPB-221: Principles of Seed Technology 3(2+1)

Theory

UNIT-I

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

UNIT-II

Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

UNIT-III

Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, methods of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.

UNIT - IV

Seed Testing for Quality Assessment Varietal Identification through Grow out Test, Seed certification, phases of certification, procedure for seed certification, field inspection.

UNIT-V

Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing. Private and public sectors and their production and marketing strategies. Seed Act and Seed Act enforcement. Seeds Control Order 1983,

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.

III. GPB-211: Fundamentals of Plant Breeding 3(2+1)
Theory

UNIT I

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

UNIT-II

Modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences. 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; Concepts of population genetics and Hardy-Weinberg Law,

UNIT-III

Multiline concept. 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.

UNIT-IV

Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses.

UNIT - V

Biotechnological tools-DNA markers and marker assisted selection.

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.

IV. GPB-311: Crop Improvement – I (Kharif) 3(2+1)

Theory

UNIT-I

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

UNIT-II

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

UNIT - III

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

UNIT-IV

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

UNIT-V

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl millet, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Cotton, 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.

V. GPB-321: Crop Improvement – II (Rabi) 3(2+1)

Theory

UNIT-I

Centers of origin, distribution of species, wild relatives in different cereals-wheat; pulses-chickpea, pea; oilseeds-rape & mustard, sunflower; fodder crops-Berseem and cash crops-sugar cane; vegetable-potato & tomato and horticultural crops;

UNIT-II

Plant genetic resources, its utilization and conservation;

UNIT - III

Study of genetics of qualitative and quantitative characters;

UNIT-IV

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

UNIT-V

Hybrid seed production technology of Rabi crops.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Chickpea, pea, Rapeseed Mustard, Sunflower, 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 crop breeding and seed production plots.

VI. GPB-212: Environmental Studies and Disaster Management 3 (2+1)

Theory

Unit-I

Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

UNIT-II

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

UNIT-III

Biodiversity and its conservation: - Introduction, definition. Biodiversity at global, National and local levels, India as a mega-diversity nation. Threats to biodiversity: habitat loss. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-IV

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

UNIT - V

Social Issues and the Environment: Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies.

Practical

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

VII. GPB-122: Fundamentals of Crop Physiology 2(1+1)

Theory

UNIT-I

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

UNIT - II

Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants:

UNIT-III

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;

UNIT-IV

Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators:

UNIT-V

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.

VIII. GPB-111: Fundamentals of Plant Biochemistry and Biotechnology 3(2+1)

Theory

UNIT-I

Biochemistry: Introduction, scope and importance in agriculture. Carbohydrate: importance and classification, structure of Monosaccharides, reducing & oxidizing properties of Monosaccharide, mutarotation; structure of Disaccharides and Polysaccharides. Lipid: importance and classification, structures and properties of fatty acids. Proteins: Importance of proteins and classification; Structures, Structural organization of proteins. Amino acids; definition classification and importance.

UNIT-II

Enzymes: General properties; Classification; Mechanism of action; Michaelies& Menten Introduction to allosteric enzymes. Vitamin: structure, role and deficiency symptoms of Vitamin-A and ascorbic acidNucleic acids: Importance and classification; Structureof Nucleotides, A, B & Z DNA.

UNIT - III

Phytoharmones: occurrence, structure and function of importance plant growth substances viz., auxins, Gibberellins, cytokinins and abscisic acid. Metabolism of carbohydrates: Glycolysis.

UNIT-IV

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, another culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids.

UNIT-V

Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agro-bacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Practical

Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action. Estimation of Ca by EDTA method, Iodometric titration. Paper chromatography demonstration for separation of amino acids. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization PCR techniques.

3. Soil Science & Agricultural Chemistry

Sl. No.	Course code	Course title	Credit hours
1.	SS-111	Fundamentals of Soil Science	3(2+1)
2.	SS-221	Problematic Soils and their Management (New)	2(2+0)
3.	SS-311	Manures, Fertilizers and Soil Fertility Management	3(2+1)
Total			**8(6+2)**

I. SS-111: Fundamentals of Soil Science 3(2+1)

Theory

Unit-I

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

Unit-II

Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Soil air, composition, gaseous exchange, problem and plantgrowth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth,

Unit-III

Soil water retention, movement and availability; Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; sources of charge; ion exchange, cation exchange capacity, base saturation.

Unit-IV

Soil organic matter: composition, properties and itsinfluence on soil properties; humic substances - nature and properties; Soil colloids- inorganic and organic; silicate clays: constitution and properties; Soil organisms: macro and microorganisms, their beneficial and harmful effects.

Unit-V

Elementary knowledge of soil taxonomy classification and soils of India. Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

Study of soil profile in field. Study of soil sampling tools, collection of representative soilsample, its processing and storage. Determination ofsoil density, moisture content and porosity. Determination of soil texture by international pipette Methods.Determination of soil pH and electrical conductivity. Determination of cation exchangecapacity of soil. Estimation of organic carbon and organic matter content of soil. Preparation of HCl extract in soil.

II. SS-221: Problematic Soils and their Management (New) 2(2+0)

Theory

Unit-I

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

Unit-II

Eroded and Compacted soils, Flooded soils, Polluted soils.

Unit-III

Reclamation and management of Saline and sodic soils, Acids oils, Acid Sulphate soils,

Unit-IV

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

Unit-V

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

III. SS-311: Manures, Fertilizers and Soil Fertility Management 3(2+1)

Theory

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients.

Unit-V

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

Practical

Introduction of analytical instruments and their principles. Estimation of soil organic carbon, Estimation of available NPK in soils. Estimation of available S, Ca, Mg and Zinc in soils. Estimation of N, P &K in plants, manures and fertilizers. Elementary idea of determination micro-nutrients. Plant tissue test

4. Entomology

Sl. No.	Course code	Course title	Credit hours
1.	ENT-121	Fundamentals of Entomology-I (Insect Morphology and Taxonomy)	2(1+1)
2.	ENT-211	Fundamentals of Entomology-II (Insect Ecology and Concept of IPM)	2(1+1)
3.	ENT-221	Pests of Crops and Stored Grains and their Management	3(2+1)
4.	ENT-321	Management of Beneficial Insects	2(1+1)
Total			**9(5+4)**

I. ENT-121: Fundamentals of Entomology-I (Insect Morphology and Taxonomy) 2(1+1)

Unit-I

History of Entomology in India. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda.

Unit-II

Morphology: Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Major sensory organs like simple and compound eyes, chemoreceptor.

Unit-III

Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Structure of male and female genital organ Types of reproduction in insects.

Unit-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, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

Unit-V

Structure and functions of insect cuticle and molting. Metamorphosis and diapause in insects. Types of larvae and pupae.

Practical

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

II. ENT-211: Fundamentals of Entomology-II (Insect Ecology and Concept of IPM) 2(1+1)

Unit-I

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.

Unit-II

Categories of pests. Concept of IPM, Practices, scope and limitations of IPM Tools of IPM: Cultural Control, Physical Control, Mechanical Control, Legal Control and Biological control.

Unit-III

Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation.

Unit-IV

Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control, Pesticidal hazards and limitations. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.

Unit-V

Plant Protection Organization, Insecticides Act 1968- Important provisions.

Practical

Insecticides and their formulations. Pesticide appliances and their maintenance. Numerical problem of Insecticide Sampling techniques for estimation of insect population and damage. Different IPM Models

III. ENT-221: Pests of crop and Stored and Their Management 3(2+1)

Theory

General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests

Unit-I

Insect pest of Field Crop

Unit-II

Insect pest of Fruits

Unit-III

Insect pest of Vegetables and Spices crop.

Unit-IV

Non - insect pests of crops and their management (mites, rodents, birds, nematode, molluscs)

Unit-V

Insect pest of stored grain and their 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) Spices Pest. Identification of insect pests 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. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.

IV. ENT-321: Management of Beneficial Insects2 (1+1)

Theory

Unit-I

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

Unit-II

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.

Unit-III

Lac production – seed lac, button lac, shellac, lac- products.

Unit-IV

Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques.

Unit-V

Important species of pollinator, weed killers and scavengers with their importance.

Practical

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

5. Agricultural Economics

Sl. No.	Course code	Course title	Credit hours
1.	AECO-121	Fundamentals of Agricultural Economics	2(2+0)
2.	AECO-211	Agricultural Finance and Co- operation	3(2+1)
3.	AECO-221	Agricultural Marketing, Trade and Prices	3(2+1)
4.	AECO-321	Farm Management, Production and Resource Economics	2(1+1)
Total			**10(7+3)**

I.AECO-121: Fundamentals of Agricultural Economics 2(2+0)

Theory

UNIT-I

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macroeconomics, positive and normative analysis.

Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.

Agricultural economics: Meaning, definition, characteristics, importance and its role in economic development. Agricultural planning and development in the country.

UNIT II

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.

Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply.

UNIT-III

Production: Process, creation of utility, factors of production, input output relationship. Law of returns: Law of variable proportions and law of returns to scale.

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

Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break-even points.

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

UNIT-IV

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, functions of money, classification of money, supply, general price index, inflation and deflation.

Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy.

UNIT-V

Agricultural and public finance: Meaning, micro v/s macro finance, need for agricultural finance, public revenue and 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.

II. AECO-211: Agricultural Finance and Co- operation 3(2+1)

Theory

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT V

Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practical

Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using

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

III. AECO-221: Agricultural Marketing, Trade and Prices 3(2+1)

Theory

UNIT-I

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets;

Demand, supply and producer's surplus of agri-commodities: Nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities;

UNIT-II

Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC;

Pricing and promotion strategies: pricing considerations and approaches – cost based and competition-based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits;

marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (AGMARK);

UNIT-III

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.

UNIT IV

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;

Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading;

UNIT-V

Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP&DMI – their objectives and functions; cooperative marketing in India;

Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy;

Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

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

IV.AECO-321: Farm Management, Production and Resource Economics 2(1+1)

Theory

UNIT-I

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

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

UNIT-II

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.

UNIT III

Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.

Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts.

UNIT-IV

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.

UNIT-V

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 input 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.

6. Agricultural Engineering

Sl. No.	Course code	Course title	Credit hours
1.	AGENG-121	Soil and Water Conservation Engineering	2(1+1)
2.	AGENG-211	Farm Machinery and Power	2(1+1)
3.	AGENG-221	Renewable Energy and Green Technology	2(1+1)
4.	AGENG-321	Protected Cultivation and Secondary Agriculture	2(1+1)
Total			**8(4+4)**

I.AGENG-121: Soil and Water Conservation Engineering 2(1+1)

Theory

UNIT I

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

UNIT II

Water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation.Soil loss measurement techniques.

UNIT III

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

UNIT IV

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

UNIT V

Principles of wind erosion control and its control measures.

Practical

General status of soil conservation in India. Calculation of erosion index. Estimation of soilloss. 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.

II. AGENG-211: Farm Machinery and Power 2(1+1)

Theory

UNIT I

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

UNIT II

Study of different components of I.C. engine, I.C. engine terminology and solved problems.

UNIT III

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,

UNIT IV

Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, implement for intercultural operations.

UNIT V

Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practical

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, Familiarizationwith lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraliccontrol system of engine, learning of tractor driving, Familiarization with operation of power tiller,

Familiarization with different types of primary and secondary tillage implements: disc plough and disc harrow. Familiarization with seedcum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivationequipment, Familiarization with harvesting and threshing machinery.

III. AGENG-221: Renewable Energy and Green Technology 2(1+1)
Theory

UNIT I

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

UNIT II

Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and bio-oil production and their utilization as bio-energy resource.

UNIT III

Introduction of solar energy, collectionand their application, Familiarization with solar energy gadgets: solar cooker, solar water heater.

UNIT IV

Application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic systemand their application,

UNIT V

Introduction of wind energy and their application.

Practical

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

IV. AGENG-321: Protected Cultivation and Secondary Agriculture 2(1+1)
Theory

UNIT I

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

UNIT II

Green house equipments, materials of construction for traditional and low-cost green houses.

UNIT III

Irrigation systems used in greenhouses, typical applications, passive solar greenhouse, hot air green house heating systems, green house drying. Cost estimation and economicanalysis.

UNIT IV

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

UNIT V

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

Practical

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

7. Plant Pathology/ Microbiology

Sl. No.	Course code	Course title	Credit hours
1.	PATHO-121	Fundamentals of Plant Pathology	4(3+1)
2.	PATHO-311	Diseases of Field & Horticultural Crops & their Management-I	3(2+1)
3.	PATHO-321	Diseases of Field & Horticultural Crops & their Management-II	3(2+1)
4.	PATHO-322	Principles of Integrated Disease Management	3(2+1)
5.	PATHO-122	Agricultural Microbiology	2(1+1)
Total			**15(10+5)**

I.PATHO-121: Fundamentals of Plant Pathology 4(3+1)

Theory

Unit-I

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology.

UNIT II

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

Unit-III

***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.

Unit-IV

***Bacteria and mollicutes*:** general morphological characters. Basic methods of classification and reproduction.

***Viruses*:** nature, structure, replication and transmission. Study of phanerogamic plant parasites.

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

Unit-V

Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development.

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

II. PATHO-311: Diseases of Field & Horticultural Crops & their Management-I 3(2+1)

Theory

Unit-I

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

Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, Sorghum: smuts, Bajra: downy mildew and ergot;

UNIT II

Legume, Plus & oil Seed Crops: groundnut: leaf spots, Soybean: Rhizoctonia blight, Pigeonpea: wilt and sterility mosaic; Castor: Phytophthora blight; Tobacco: mosaic.

Unit-III

Vegetable crops: Cruciferous: Alternaria leaf spot, Brinjal: Phomopsis blight, fruit rot and Sclerotinia blight; Potato: early blight, late blight and mosaic, Tomato: damping off, wilt, late blight, and leaf curl, Okra: Yellow Vein Mosaic; Beans: anthracnose, Ginger: soft rot;

Unit-IV

Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka leaf spot and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight;

Unit-V

Plantation crops: Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

Practical

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

III.PATHO-321: Diseases of Field & Horticultural Crops & their Management-II 3(2+1)

Theory

Unit-I

Wheat and pulses crops: Symptoms, etiology, disease cycle and management of following diseases:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, and ear cockle; Gram: wilt, and Ascochyta blight; Lentil: rust

Unit-II

Oil seed Cash crops: Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, and downy mildew; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting**; Cotton**: vascular wilt, and black arm

Unit-III

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

Unit-IV

Vegetable: Cucurbits: downy mildew, powdery mildew, wilt; Onion: purple blotch, Pea: downy mildew, powdery mildew and rust.

Unit-V

Spices and Ornamental crops: Chillies: fruit rot, and leaf curl; Turmeric: leaf spot; Coriander: stem gall. Marigold: Botrytis blight. Rose: dieback, powdery mildew and black leaf spot.

Practical

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

IV. PATHO-322: Principles of Integrated Disease Management3 (2+1)

Theory

Unit I

IDM: Introduction, history, importance, concepts, principles and tools of IDM.

Unit-II

Categories of diseases. Economic importance of diseases and methods of detection and diagnosis of diseases.

Unit III

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

Unit IV

Ecological management of crop environment. Introduction to conventional fungicide for the disease management. Survey surveillance and forecasting of diseases. Development and validation of IDM module.

Unit V

Implementation and impact of IDM module for disease. Safety issues in fungicides uses. Political, social and legal implication of IDM. Case histories of important IDM programmes.

Practical

Methods of diagnosis and detection of various plant diseases, Methods of plant disease measurement, Assessment of crop yield losses, calculations based on economics of IDM. Identification of biocontrol agents. Mass multiplication of *Trichoderma*and*Pseudomona*s. Identification andnature of damage of important diseases and their management. Crop (agro-ecosystem) dynamics of a selecteddiseases. Plan & assess preventive strategies (IDM module) and decision making. Crop monitoring attacked by diseases. Awareness campaign at farmer's fields.

V. PATHO-122: Agricultural Microbiology 2(1+1)

Theory

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

Practical

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

8. Horticulture

Sl. No.	Course code	Course title	Credit hours
1.	HORT-111	Fundamentals of Horticulture	2(1+1)
2.	HORT-221	Production Technology for Fruit and Plantation Crops	2(1+1)
3.	HORT-121	Production Technology for Vegetable and Spices	2 (1+1)
4.	HORT-211	Production Technology for Ornamental Crops, MAPs and Landscaping	3 (2+1)
5.	HORT-321	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
6.	HORT-112	Introduction to Forestry	2(1+1)
Total			**13(7+6)**

I.HORT-111: Fundamentals of Horticulture 2(1+1)

Theory

Unit-I

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

Unit-II

Climate and soil for horticultural crops. Plant propagation-methods and propagating structures; Seed dormancy, Seed germination,

UNIT - III

Principles of orchard establishment; Principles and methods of training and pruning.

Unit-IV

Juvenility, Flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy.

Unit-V

Importance of plant bio-regulators in horticulture, irrigation – methods, Fertilizer application in horticultural crops.

Practical

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

II. HORT-221: Production Technology for Fruit and Plantation Crops2(1+1)

Theory

Unit-I

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

Unit-II

Importance of rootstocks. Production technologies for the cultivation of major fruits- mango, banana, guava and papaya.

Unit-III

Production technologies for the cultivation of major fruits- citrus, grape, litchi, sapota and apple, pear, peach, walnut, almond.

UNIT - IV

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

Unit-V

Plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

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

III.HORT-121: Production Technology for Vegetable and Spices 2 (1+1)

Theory

Unit-I

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

Unit-II

Production technology of Tomato, Brinjal, Chilli and Capsicum.

Unit-III

Production technology of Cucumber, Melons, Gourds, Pumpkin, French bean and Peas.

Unit-IV

Production technology of Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic & spices crops such as-coriander, turmeric and ginger etc.

UNIT - V

Production technology of root crops such as Carrot, Radish, Beet root, Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak.Perennial vegetables.

Practical

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

IV.HORT-211: Production Technology for Ornamental Crops, MAPs and Landscaping 2 (1+1)

Theory

Unit-I

Importance and scope of ornamental crops, medicinal and aromatic plants.

Unit-II

Landscaping and principles of landscaping. Landscape uses of trees, shrubs and climbers.

Unit-III

Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions.

Unit-IV

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

Unit-V

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

Practical

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

V. HORT-321: Post-harvest Management and Value Addition of Fruits and Vegetables 2(1+1)

Unit -I

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

Unit -II

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

Unit -III

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

Unit -IV

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;

Unit -V

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.

VI. HORT-112: Introduction to Forestry (New) 2(1+1)

Theory

Unit-I

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

Unit-II

Forest regeneration, Natural regeneration natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificialregeneration – objectives, choice between natural and artificial regeneration, essential preliminaryconsiderations.

Unit-III

Crown classification. Tending operations – weeding, cleaning, thinning –mechanical, ordinary, crown and advance thinning.

Unit-IV

Forest menstruation – objectives, diametermeasurement, instruments used in diameter measurement; Non instrumental methods of heightmeasurement - shadow and single pole method; Instrumental methods of height measurement- geometric and trigonometric principles, instruments used in height measurement; tree stemform, form factor, form quotient, measurement of volume of felled and standing trees, agedetermination of trees.

Unit-V

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

Practical

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

9. Agricultural Extension

Sl. No.	Course code	Course title	Credit hours
1.	EXT-121	Fundamentals of Agricultural Extension Education	3(2+1)
2.	EXT-111	Rural Sociology & Educational Psychology	2(2+0)
3.	EXT-311	Entrepreneurship Development and Business Communication	2 (1+1)
4.	EXT-221	Communication Skills and Personality Development	2 (1+1)
Total			**9(6+3)**

I.EXT-121: Fundamentals of Agricultural Extension Education 3(2+1)
Theory

Unit-I

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

Unit-II

Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.). New trends inagriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Unit-III

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D.

Unit-IV

Rural Leadership: concept and definition, types of leaders in rural context. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes;

Unit-V

Transfer of technology: concept and models, capacity building of extension personnel; extension teachingmethods: meaning, classification, individual, group and mass contact methods, ICT Applicationsin TOT (New and Social Media), media mix strategies;

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 ofAV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories andsuccess stories; Presentation skills exercise; micro teaching exercise; A visit to village to understandthe problems being encountered by the villagers/ farmers; to study organization and functioningof 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 invillage development planning; exposure to mass media: visit to community radio and televisionstudio for understanding the process of programme production.

II. EXT-111: Rural Sociology & Educational Psychology 2(2+0)
Theory

Unit-I

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

Unit-II

Rural society, Social Groups, Social Stratification, Culture concept, Social Institution,

Unit-III

Social Change & Development. Educational psychology: Meaning & its importance in agriculture extension.

Unit-IV

Behavior: Cognitive, affective, psychomotor domain,

Unit-V

Personality, Learning, Motivation, Theories of Motivation, Intelligence.

III. EXT-311: Entrepreneurship Development and Business Communication 2 (1+1)

Theory

Unit-I

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

Unit-II

Impact of economic reforms on Agribusiness/ Agri-enterprises, Entrepreneurial Development Process;

Unit-III

Business Leadership Skills; developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation),

Unit-IV

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

Unit-V

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 achievementmotivation, 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.

IV. EXT-311: Communication Skills and Personality Development 2 (1+1)

Theory

Unit-I

Communication: meaning, definition, principles, process of communication, models and barriers to communication.

Unit-II

Verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

Unit-III

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

Unit-IV

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

Unit-V

Diffusion and adoption of innovation: concept and meaning, process and stages of adoption, categories.

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 andtechnical articles, precise writing, summarizing, abstracting; individual and group presentations.

10. Statistics, Computer Application and IPR

Sl. No.	Course code	Course title	Credit hours
1.	STAT-211	Statistical Methods	2(1+1)
2.	COMP-211	Agri-Informatics	2(1+1)
3.	IPR-311	Intellectual Property Rights	1(1+0)
Total			**5(3+2)**

I.STAT-211: Statistical Methods 2(1+1)

Theory

Unit I

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

Unit II

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

UNIT - III

Definition of Correlation, Scatter Diagram.Karl Pearson's Coefficient of Correlation.Linear Regression Equations.

Unit IV

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

Unit V

Introduction to Analysis of Variance, Analysis of One-Way Classified data. Introduction to Sampling Methods, Simple Random Sampling with and without replacement.

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, Measures of Dispersion (Ungrouped Data).Measures of Dispersion (Grouped Data).Application of One Sample t-test.Application of Two Sample Fisher's t-test.Chi-Square test of Goodness of Fit.Chi-Square test of Independence of Attributes for 2 ×2 contingency table.Analysis of Variance One Way Classification.Analysis of Variance Two Way Classification.Selection of random sample using Simple Random Sampling.

II.COMP-211: Agri-Informatics 2(1+1)

Theory

UNIT - I

Introduction to Computers, Specifications & Limitations. Types of Computers, Operating Systems, definition and types with DOS.

UNIT - II

Applications of MSOffice for document creation & Editing, Data presentation, interpretation and graph creation, mathematical expressions, Basic Introduction of DBMS-definition and features.

UNIT - III

Computer Hardware and Software. World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations.

UNIT - IV

e-Agriculture, concepts and applications, Use of ICT in Agriculture. Smartphone Apps in Agriculture for farm advises, e-market, market price etc.

UNIT - V

Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions.

Practical

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as DOS, windows, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a Document. MS-EXCEL - Creating a spreadsheet, writing expressions, creating graphs, analysis of data. MS-ACCESS: Creating Database, generating reports. Introduction to World Wide Web (WWW). Introduction of programming languages.

III. IPR-311: Intellectual Property Rights 1(1+0)

Theory

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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, accessand benefit sharing.

11. Animal Production

Sl. No.	Course code	Course title	Credit hours
1.	AS-211	Livestock & Poultry Management	4(3+1)
2.	AS-311	Principles of Food Science and Nutrition	2(2+0)
Total			**6(5+1)**

I. AS-211: Livestock & Poultry Management 4(3+1)

Theory

UNIT I

Role of livestock in the national economy. Reproduction in farm animals and poultry.

Unit-II

Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

UNIT III

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

UNIT IV

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

UNIT V

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

Practical

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

II. AS-311: Principles of Food Science and Nutrition 2(2+0)

Theory

Unit-I

Definition, scope and importance of food science, definition and composition of food, foods of animal origin with special reference to milk.

Unit-II

Food microbiology with special reference to milk, definition and composition of milk and colostrum.

Unit-III

Physico-chemical properties of milk. Factor affecting of quality and quantity of milk.

Unit-IV

Pasteurization, sterilization, bactofugation, UHT and homogenization of milk, cooling and chilling of milk. Filtration and clarification of milk.

Unit-V

Milk adulteration and its detection, common preservative of milk and their detections. Availability, functions and nutritional deficiency disease of minerals and vitamins.

12. English

ENG-111: Comprehension and Communication Skills in English 2(1+1)

Theory

Unit-I

Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement.

Unit-II

Transformation, Synthesis, Direct and Indirect Narration.

Unit-III

Reading Comprehension, 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.

Unit-IV

Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing. The Style: Importanceof professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

Unit-V

Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confusedwords. Exercises to Help the students in the enrichment of vocabulary based on TOEFL andother competitive examinations.

Practical

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

13. REMEDIAL COURSES

Sl. No.	Course code	Course title	Credit hours
1.	AGR-111	Agricultural Heritage (New Course)	1(1+0)
2.	GPB-112/ MATH-111	Introductory Biology (New)/Elementary Mathematics	2(1+1)/ 2(2+0)
Total			**3**

1. AGR-111: Agricultural Heritage 1(1+0)

Theory

Unit-I

Introduction of Indian agricultural heritage; Ancient agricultural practices,

Unit-II

Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society Indian agricultural scientists of Repute.

Unit-III

Journey of Indian agriculture and its development from past to modern era; Plant productionand protection through indigenous traditional knowledge; Crop voyage in India and world

Unit-IV

Agriculture scope; Importance of agriculture and agricultural resources available in India; Cropsignificance and classifications; National agriculture setup in India

Unit-V

Current scenario of Indianagriculture; Indian agricultural concerns and future prospects.

2. GPB-112: Introductory Biology 2(1+1)

Theory

Unit-I

Introduction to the living world, diversity and characteristics of life, origin of life,

Unit-II

Evolutionand Eugenics.Binomial nomenclature and classification Cell and cell division.

Unit-III

Morphology of flowing plants. Seed and seed germination.

Unit-IV

Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae.

Unit-V

Role of Bio-science in agriculture.

Practical

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

3. MATH-111: Elementary Mathematics 2(2+0)

Theory

Unit-I

Straight lines : Distance formula, section formula (internal and external division), Changeof 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 formof equation of line, Intercept form of equation of line, Normal form of equation of line, Generalform of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallellines, Perpendicular lines, Angle of bisectors between two lines.

Unit-II

Area of triangle and quadrilateral. Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equationof circle passing through three given points, Equation of circle whose diameters is line joining twopoints (x_1, y_1) & (x_2, y_2).

Unit-III

Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Simple problemson 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 (Simpleproblem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation bysubstitution method and simple problems based on it, Differentiation of Inverse Trigonometricfunctions. Maxima and Minima of the functions of the form y=f (x) (Simple problems based onit),

UNIT - IV

Integral Calculus: Integration of simple functions, Integration of Product of two functionsand Integration by substitution method.

Unit-V

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

14. Non-Gradial Courses

Sl. No.	Course code	Course title	Credit hours
1.	NSS-/PEYP	NSS/Physical Education & Yoga Practices	1(0+1)
3.	HVE-121	Human Value and Ethics	1(1+0)
4.	ET-321	Educational Tour	2(0+2)
Total			**4(1+3)**

NSS/PHYSICAL EDUCATION & YOGA PRACTICES

Theory

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

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

1. Introduction and basic components of NSS: Orientation
2. NSS programmes and activities
3. Understanding youth
4. Community mobilisation
5. Social harmony and national integration
6. Volunteerism and shramdan
7. Citizenship, constitution and human rights
8. Family and society
9. Importance and role of youth leadership
10. Life competencies
11. Youth development programmes
12. Health, hygiene and sanitation
13. Youth health, lifestyle, HIV AIDS and first aid
14. Youth and yoga
15. Vocational skill development

16. Issues related environment
17. Disaster management
18. Entrepreneurship development
19. Formulation of production-oriented project
20. Documentation and data reporting
21. Resource mobilization
22. Additional life skills
23. Activities directed by the Central and State Government

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

SYLLABUS

Semester I

NSS-/PEYP: NSS/PHYSICAL EDUCATION & YOGA PRACTICES

Course Title: National Service Scheme I

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 volunteer's awareness about health

NSSprogrammes and activities

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

Understanding youth

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

Community mobilisation

Mapping of community stakeholders, designing the message as per problems and theirculture; 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 peacebuilding

Volunteerism and shramdan

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

Citizenship, constitution and human rights

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

Family and society

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

Semester II

Course Title: National Service Scheme II

Importance and role of youth leadership

Meaning, types and traits of leadership, qualities of good leaders; importance and roles ofyouth leadership

Life competencies

Definition and importance of life competencies, problem-solving and decision-making, interpersonal communication

Youth development programmes

Development of youth programmes and policy at the national level, state level and voluntarysector; youth-focused and youth-led organizations

Health, hygiene and sanitation

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

Youth health, lifestyle, HIV AIDS and first aid

Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid

Youth and yoga

History, philosophy, concept, myths and misconceptions about yoga; yoga traditions and itsimpacts, yoga as a tool for healthy lifestyle, preventive and curative method

Semester III

Issues related environment

Environmental conservation, enrichment and sustainability, climatic change, natural resourcemanagement (rain water harvesting, energy conservation, forestation, waste land developmentand soil conservations) and waste management

Disaster management

Introduction and classification of disaster, rehabilitation and management after disaster; role of NSS volunteers in disaster management.

Semester IV

Youth and crime

Sociological and psychological factors influencing youth crime, cyber crime, pear mentoring in preventing crime and awareness for juvenile justice

Civil/self defense

Civil defense services, aims and objectives of civil defense; needs and training of self defense

Resource mobilization

Writing a project proposal of self fund units (SFUs) and its establishment

Additional life skills

Positive thinking, self confidence and esteem, setting life goals and working to achieve them, management of stress including time management.

Physical Education and Yoga Practices

Semester I: Physical Education and Yoga Practices

1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)

3. Teaching of advance skills of Football – involvement of all the skills in game situation withteaching of rules of the game
4. Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation
6. Teaching of skills of Basketball – involvement of all the skills in game situation with teachingof rule of the game
7. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advance skills of Kabaddi – involvement of all the skills in game situation withteaching of rule of the game
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction ofskills, involvement in game situation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situation withteaching 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 practiceand involvement in game situation
15. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practiceand involvement in game situation
16. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teachingof rule of the game

Semester II: Physical Education and Yoga Practices

1. Teaching of skills of Hockey – demonstration practice of the skills and correction.
2. Teaching of skills of Hockey – demonstration practice of the skills and correction. Andinvolvement 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 withcompetition among them.

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

2. HVE-121: Human Value and Ethics 1(1+0)

Theory

Unit-I

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

Unit-II

Principles and Philosophy. Self Exploration.

Unit-III

Self Awareness. Self Satisfaction. Decision Making and Motivation.

Unit-IV

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

Unit-V

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

3. ET-321: Educational Tour 2 (0+2)

ELECTIVE COURSES

Sl. No.	Course code	Courses	Credits
1.	AECO EC-01	Agribusiness Management	3(2+1)
2.	SS EC-01	Agrochemicals	3(2+1)
3.	GPB EC-01	Commercial Plant Breeding & Seed Industry	3(1+2)
4.	HORT EC-01	Landscaping	3(2+1)
5.	AS EC-01	Food Safety and Standards	3(2+1)
6.	ENT EC-01	Bio-pesticides & Bio-fertilizers	3(2+1)
7.	AGENG EC-01	Protected Cultivation	3(2+1)
8.	GPB EC-02	Micro propagation Technologies	3(1+2)
9.	HORT EC-02	Hi-tech. Horticulture	3(2+1)
10.	AGRO EC-01	Weed Management	3(2+1)
11.	AGRO EC-02	System Simulation and Agro-advisory	3(2+1)
12.	EXT EC-01	Agricultural Journalism	3(2+1)

Agri-business Management 3 (2+1)

Theory

Unit-I

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New AgriculturalPolicy. Distinctive features of Agribusiness Management:

Unit-II

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. Businessenvironment: PEST & SWOT analysis. Management functions: Roles & activities, Organizationculture.

Unit-III

Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget. Components of a business plan, Stepsin 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.

Unit-IV

Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales& Distribution Management. Pricing policy, various pricing methods.

Unit-V

Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retails trade commodity trading, and value addedproducts. Study of financing institutions- Cooperative, Commercial banks, RRBs, 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 agriculturalcommodities. Net present worth technique for selection of viable project. Internal rate of return.

2. Agro-chemicals 3 (2+1)

Theory

Unit-I

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

Unit-II

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

Unit-III

Introduction and classification of insecticides: inorganic andorganic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids. Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn andrestricted use, Fate of insecticides in soil & plant. IGRs Bio-pesticides, reduced risk insecticides,

Unit-IV

Botanicals, plant and animal systemic insecticides their characteristics and uses. Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing ofammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparationof bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing ofpotassiumchloride, potassium sulphate and potassium nitrate.

UNIT - V

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

Practical

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anionandcation in fertilizer. Calculation of doses of insecticides to be used. To study and identify variousformulations 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 & Seed Industry 3(2+1)

Theory

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV& FR Act. Variety testing, release and notification systems in India.

UNIT - V

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. Techniquesof seed production in self and cross pollinated crops using A/B/R and two line system. Learningtechniques in hybrid seed production using male-sterility in field crops. Understandingthe difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seedproduction. Concept of rouging in seed production plot. Concept of line its multiplication andpurification 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 testingand 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 privateseed production and processing plants.

4. Landscaping 3(2+1)

Theory

Unit-I

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

Unit-II

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

Unit-III

Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme,

Unit-IV

Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and ruralareas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railwaystation, townships, river banks, hospitals, play grounds, airports, industries, institutions.

Unit-V

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 andmaintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computersoftware, visit to important gardens/ parks/ institutes.

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

Theory

Unit-I

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards andRisks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design. Hygiene and Sanitation in

Unit-II

Food Service Establishments- Introduction, Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.

Unit-III

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 andAuditing, Water Analysis, Surface Sanitation and Personal Hygiene.

Unit-IV

Food laws and Standards-Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards relatedto food. Recent concerns- New and Emerging Pathogens.

Unit-V

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 surfacesanitation by swab/rinse method.Assessment of personal hygiene. Biochemical tests foridentification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plansfor Implementation of FSMS - HACCP, ISO: 22000.

6. Bio-pesticides&Bio-fertilizers 3(2+1)

Theory

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Productiontechnology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers.

Unit-V

FCO specifications and quality control of biofertilizers. Applicationtechnology 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 biopesticidelaboratory in nearby area. Field visit to explore naturally infected cadavers. Identification ofentomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of *Azospirillum ,Azotobacter, Rhizobium*, P-solubilizers and vcyano

bacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AMfungi - Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

7. Protected Cultivation 3(2+1)

Theory

Unit-IV

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

Unit-II

Cladding material involved ingreenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation.Soil preparation and management, Substrate management.

Unit-III

Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting materialof horticultural crops.

Unit-IV

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

UNIT V

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 culturaloperations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.

8. Micro propagation Technologies 3(1+2)

Theory

Unit-I

Introduction, History, Advantages and limitations

Unit-II

Types of cultures (seed, embryo, organ, callus, cell),

Unit-III

Stages of micro propagation, Auxiliary bud proliferation (Shoot tip and meristemculture, bud culture), Organogenesis (callus and direct organ formation), Aeropoics and tuberlet production of Potato

Unit-IV

Somatic embryogenesis, cell suspension cultures,

UNIT - V

Production of secondary metabolites, Somaclonal variation, Cryopreservation

Practical

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

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

Theory

Unit-I

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

Unit-II

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

Unit-III

Micro irrigation systems and its components; EC, pH-based fertilizer scheduling.

Unit-IV

Canopy management, high density orcharding. Components of precision farming. Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS).

Unit-V

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanizedharvesting 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.

10. Weed Management 3(2+1)

Theory

Unit-I

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

UNIT - II

Classification, reproduction and dissemination of weeds.

Unit-III

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

Unit-IV

Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utilityin agriculture.

Unit-V

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 agrochemicalsstudy. 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 andweed index.

11. System Simulation and Agro advisory 3(2+1)

Theory

Unit-I

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

Unit-II

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

Unit-III

Crop production in moisture and nutrientslimited conditions; components of soil water and nutrients balance.

UNIT - IV

Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars.

Unit-V

Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

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

12. Agricultural Journalism 3(2+1)

Theory

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories:

Unit-V

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 titlewriting, proofreading, layouting. Testing copy with a readability formula. Visit to a publishingoffice.