Faculty of Science

B. Sc. Agriculture (Hons.)

4 Years Degree Course

(w.e.f. 2016-2017)

- **Scheme of Examination**
- **Detailed Syllabi**

University Campus

NH-12, Chaksu Bypass, Tonk Road, Jaipur-303901
Phone : 0141-3020500/555,Fax : 0141-3020538

Plot No.-IP-2 & 3, Phase-IV, Sitapura Industrial Area, Jaipur-202022
Phone : 0141-4071551/552, Fax : 0141-4071562

Faculty of Science

B. Sc. Agriculture (Hons.)

4 Years Degree Course

Scheme of Examination & Detailed Syllabi

* Approved by AC vide resolution no. ……. Dated ……

B.Sc. Agriculture (Hons.) 4 Years Course

List of Courses :-

ABILITY ENHANCEMENT COMPULSARY COURSES (AECC)

- Environmental Science (ENVS 4321)
- Elementary Mathematics (MATHS 4111)
- Comprehensive and Communication Skills in English (ENG 4111)

CORE COURSES :-

- Introductory Agriculture and Principles of Agronomy (AGRON 4111)
- Principles of Genetics (PBG 4111)
- Introduction to Soil Science (SCHEM 4111)
- Dimensions of Agricultural Extension (EXTED 4111)
- Agricultural Microbiology (PPATH 4111)
- Agricultural Meteorology (AGRON 4121)
- Principles of Plant Breeding (PBG 4121)
- Plant Pathogens and Principles of Plant Pathology (PPATH 4121)
- Insect Morphology and Systematics (ENTO 4121)
- Principles of Agricultural Economics (AGECON 4121)
- Fundamentals of Soil and Water Conservation Engineering (AENGG 4121)
- Biochemistry (BIOCH 4121)
- Soil Chemistry, Soil Fertility and Nutrient Management (SCHEM 4121)
- Weed Management (AGRON 4212)
- Introductory Nematology (NEMAT 4211)
- Statistics (STAT 4211)
- Fundamentals of Rural Sociology and Educational Psychology (EXTED 4211)
- Production Technology of Fruits and Plantation Crops (HORT 4211)
- Production Economics and Farm Management (AGECON 4211)
- Farm Power and Machinery (AENGG 4211)
- Manures And Fertilizers (SCHEM 4211)
- Practical Crop Production -1(*Kharif* crops) (AGRON 4311)
- Rainfed Farming (AGRON 4312)
- Principles of Plant Biotechnology (BT 4311)

- Crop and stored grain pests and their management (ENTO 4311)
- Breeding of Field and Horticultural Crops (PBG 4311)
- Agricultural Marketing, trade and Prices (AGECON 4311)
- Protected cultivation and Post harvest Technology (AENGG 4311)
- Diseases of Field Crops and their management (PPATH 4311)
- Production technology of Spices, Aromatic and Medicinal crops (HORT 4311)
- Practical Crop Production -II (Rabi) (AGRON 4321)
- Farming Systems, Sustainable Agriculture and Organic Farming (AGRON 4322)
- Principles of Seed Technology (PBG 4321)
- Extension Methodologies for Transfer of Agricultural Technology (EXTED 4321)
- Livestock Production and Management (LPM 4321)
- Post harvest management and value addition of fruits and vegetables (HORT 4321)
- Diseases of Horticultural Crops and their management (PPATH 4321)
- Fundamentals of Agri. Business Management (AGECON 4321)
- Field Crops- II (*Kharif*) (AGRON 4211)
- Field Crops- II (Rabi) (AGRON 4221)
- Water Management (AGRON 4222)
- Soil survey, Land Use Planning and Remote Sensing (SCHEM 4221)
- Insect Ecology and Integrated Pest Management including Beneficial Insects (ENTO 4221)
- Production Technology of Vegetables and Flowers (HORT 4221)
- Agricultural Finance and Co-operation (AGECON 4221)
- Crop Physiology (PPHYS 4221)
- Entrepreneurship Development and Communication Skills (EXTED 4221)

ELECTIVES (DISCIPLINE CENTRIC) COURSES :-

- Advanced Seed Technology (PBG 4411)
- Applied Weed Management (AGRON 4411)
- Vermi-composting and Organic farming (SCHEM 4411)
- Soil, Plant and Water Analysis (SCHEM 4412)
- Soil Management (SCHEM 4413)
- Dairy Cattle Production (LPM 4411)
- Plant Growth regulators in Agriculture (PPHYS 4411)
- Plasticulture in Agriculture (AENGG 4411)

- Advanced Seed Technology (PBG 4411)
- Tissue culture and Micro-propagation techniques (PBG 4412)
- Bio-agents and Integrated Disease Management (PPATH 4411)
- Detection and Management of seed borne pathogens (PPATH 4412)
- Non -Insect Pests and their management (ENTO 4411)
- Bio-control agents and Bio-pesticides (ENTO 4412)
- Plant Growth regulators in Agriculture (PPHYS 4411)
- Economic Nematology (NEMAT 4411)
- Bio-control agents and Bio-pesticides (ENTO 4412)
- Vermi-composting and Organic farming (SCHEM 4411)
- Tissue culture and Micro-propagation techniques (PBG 4412)
- Plasticulture in Agriculture (AENGG 4411)
- Nursery Management of Horticultural Crops (HORT 4411)
- Commercial Vegetable Production (HORT 4412)
- Commercial Fruit Production (HORT 4413)
- Plant Growth regulators in Agriculture (PPHYS 4411)
- Marketing Management (AGECON 4411)
- Project Formulation, Evaluation and Monitoring (AGECON 4412)
- Natural Resource Economics and Management (AGECON 4413)
- Visuals and Graphic Communications (EXTED 4411)
- Govt. Policies and Programs in Agriculture (EXTED 4412)
- Sampling Techniques (STAT 4411)
- Dairy Cattle Production (LPM 4411)
- Poultry Production and Management (LPM 4412)

GENERIC/OPEN ELECTIVES COURSES:-

- Intellectual Property Rights (IPR 4413)
- Sustainable Development (SD4414)
- Indigenous Technology Knowledge (ITK 4415)
- Value addition in Pearl millet (VAP 4416)
- Production of Organic Manures (POM 4417
- Installation of Sprinkler and Drip irrigation unit (ISD 4418)
- N.S.S.

SKILL ENHANCEMENT COURSES (SEC) :-

- Introduction to Computer Applications (COMP 4111)
- Disaster management (DSM 4419)
- Research Station/KVK/ including village attachment and In-situ interaction of
- farmers, students and research station scientists (ITK 4420)
- In-situ interaction of farmers, college faculty and students (IITK 4421)
- Educational Tour (ET 4423)
- Project Report Preparation and Evaluation (PRP 4424)
- Industrial Attachment*/Skill Development/Experiential Learning Courses (IA 4425)

Course Structure: B. Sc.-Agriculture (Hons.)

FIRST SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 101	Introductory Agriculture and Principles of Agronomy	CORE	2	2	30	70	50	100	3(2+1)
Ag 102	Principles of Genetics	CORE	2	2	30	70	50	100	3(2+1)
AG 103	Introduction to Soil Science	CORE	2	2	30	70	50	100	3(2+1)
AG 104	Dimensions of Agricultural Extension	CORE	1	2	30	70	50	100	2(1+1)
AG 105	Agricultural Microbiology	CORE	2	2	30	70	50	100	3 (2+1)
AG 106	Elementary Mathematics	AECC	2	0	30	70	-	100	2(2+0)
AG 107	Comprehensive and Communication Skills in English	AECC	2	2	30	70	50	100	3(2+1)
AG 108	Introduction to Computer Applications	SEC	1	2	30	70	50	100	2(1+1)
AG 109	NCC/NSS	GENERIC	-	-	-	-	-	-	-
TOTAL			**14**	**14**	**240**	**560**	**350**	**1150**	**21**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

SECOND SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 201	Agricultural Meteorology	CORE	1	2	30	70	50	150	2 (1+1)
AG 202	Principles of Plant Breeding	CORE	2	2	30	70	50	150	3(2+1)
AG 203	Plant Pathogens and Principles of Plant Pathology	CORE	3	2	30	70	50	150	4 (3+1)
AG 204	Insect Morphology and Systematics	CORE	2	2	30	70	50	150	3 (2+1)
AG 205	Principles of Agricultural Economics	CORE	2	0	30	70	-	100	2 (2+0)
AG 206	Fundamentals of Soil and Water Conservation Engineering	CORE	1	2	30	70	50	150	2(1+1)
AG 207	Biochemistry	CORE	2	2	30	70	50	150	3 (2+1)
AG 208	Soil Chemistry, Soil Fertility and Nutrient Management	CORE	1	2	30	70	50	150	2(1+1)
AG 209	NCC/NSS	GENERIC	-	-	-	-	-	-	-
TOTAL			**14**	**14**	**240**	**560**	**350**	**1050**	**21**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

THIRD SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 301	Field Crops-I (*Kharif*)	CORE	2	2	30	70	50	150	3 (2+1)
AG 302	Weed Management	CORE	1	2	30	70	50	150	2 (1+1)
AG 303	Introductory Nematology	CORE	1	2	30	70	50	150	2 (1+1)
AG 304	Statistics	CORE	2	2	30	70	50	150	3(2+1)
AG 305	Fundamentals of Rural Sociology and Educational Psychology	CORE	2	0	30	70	-	100	2(2+0)
AG 306	Production Technology of Fruits and Plantation Crops	CORE	2	2	30	70	50	150	3(2+1)
AG 307	Production Economics and Farm Management	CORE	1	2	30	70	50	150	2 (1+1)
AG 308	Farm Power and Machinary	CORE	1	2	30	70	50	150	2(1+1)
AG 309	Manures And Fertilizers	CORE	1	2	30	70	50	150	2 (1+1)
AG 310	NCC/NSS	GENERIC	-	-	-	-	-	-	-
TOTAL			**13**	**16**	**270**	**630**	**400**	**1300**	**21**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

FOURTH SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 401	Field Crops- II (*Rabi*)	CORE	2	2	30	70	50	150	3 (2+1)
AG 402	Water Management	CORE	1	2	30	70	50	150	2 (1+1)
AG 403	Soil survey, Land Use Planning and Remote Sensing	CORE	1	2	30	70	50	150	2(1+1)
AG 404	Insect Ecology and Integrated Pest Management including Beneficial Insects	CORE	2	2	30	70	50	150	3(2+1)
AG 405	Production Technology of Vegetables and Flowers	CORE	3	2	30	70	50	150	4(3+1)
AG 406	Agricultural Finance and Co-operation	CORE	1	2	30	70	50	150	2(1+1)
AG 407	Crop Physiology	CORE	2	2	30	70	50	150	3(2+1)
AG 408	Entrepreneurship Development and Communication Skills	CORE	1	2	30	70	50	150	2(1+1)
AG 409	NCC/NSS	GENERIC	-	2	-	-	50	50	1(0+1)
TOTAL			**13**	**18**	**240**	**560**	**450**	**1250**	**22**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

FIFTH SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 501	Practical Crop Production - 1(*Kharif* crops)	CORE	0	2	-	-	50	50	1 (0+1)
AG 502	Rainfed Farming	CORE	1	2	30	70	50	150	2 (1+1)
AG 503	Principles of Plant Biotechnology	CORE	2	2	30	70	50	150	3(2+1)
AG 504	Crop and stored grain pests and their management	CORE	3	2	30	70	50	150	4(3+1)
AG 505	Breeding of Field and Horticultural Crops	CORE	2	2	30	70	50	150	3(2+1)
AG 506	Agricultural Marketing, trade and Prices	CORE	1	2	30	70	50	150	2(1+1)
AG 507	Protected cultivation and Post harvest Technology	CORE	1	2	30	70	50	150	2(1+1)
AG 508	Diseases of Field Crops and their management	CORE	2	2	30	70	50	150	3(2+1)
AG 509	Production technology of Spices, Aromatic and Medicinal crops	CORE	1	2	30	70	50	150	2(1+1)
TOTAL			**13**	**18**	**240**	**560**	**450**	**1250**	**22**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

SIXTH SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 601	Practical Crop Production –II *(Rabi)*	CORE	0	2	-	-	50	50	1 (0+1)
AG 602	Farming Systems, Sustainable Agriculture and Organic Farming	CORE	2	2	30	70	50	150	3 (2+1)
AG 603	Principles of Seed Technology	CORE	2	2	30	70	50	150	3(2+1)
AG 604	Extension Methodologies for Transfer of Agricultural Technology	CORE	1	2	30	70	50	150	2(1+1)
AG 605	Livestock Production and Management	CORE	2	2	30	70	50	150	3(2+1)
AG 606	Environmental Science	AECC	2	2	30	70	50	150	3(2+1)
AG 607	Post harvest management and value addition of fruits and vegetables	CORE	2	2	30	70	50	150	3(2+1)
AG 608	Diseases of Horticultural Crops and their management	CORE	1	2	30	70	50	150	2(1+1)
AG 609	Fundamentals of Agri. Business Management	CORE	1	2	30	70	50	150	2(1+1)
TOTAL			**13**	**18**	**240**	**560**	**450**	**1250**	**22**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

SEVENTH SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
GROUP A: CROP PRODUCTION AND ALLIED DISCIPLINES (any six papers are to be opted)									
AG A701	Advanced Seed Technology	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A702	Applied Weed Management	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A703	Vermi-composting and Organic farming	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A704	Soil, Plant and Water Analysis	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A705	Soil Management	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A706	Dairy Cattle Production	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A707	Plant Growth regulators in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A708	Plasticulture in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
GROUP B: PLANT SCIENCE AND PLANT PROTECTION (any six papers are to be opted)									
AG B 701	Advanced Seed Technology	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 702	Tissue culture and Micro-propagation techniques	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 703	Bio-agents and Integrated Disease Management	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 704	Detection and Management of seed borne pathogens	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 705	Non –Insect Pests and their management	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 706	Bio-control agents and Bio-pesticides	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 707	Plant Growth regulators in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 708	Economic Nematology	ELECTIVE	1	4	30	70	50	150	3(1+2)

GROUP C: HORTICULTURE AND ALLIED SCIENCES (any six papers are to be opted)									
AG C 701	Bio-control agents and Bio-pesticides	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 702	Vermi-composting and Organic farming	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 703	Tissue culture and Micro-propagation techniques	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 704	Plasticulture in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 705	Nursery Management of Horticultural Crops	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 706	Commercial Vegetable Production	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 707	Commercial Fruit Production	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 708	Plant Growth regulators in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
GROUP D: SOCIAL SCIENCES (any six papers are to be opted)									
AG D 701	Marketing Management	ELECTIVE	2	2	30	70	50	150	3(2+1)
AG D 702	Project Formulation, Evaluation and Monitoring	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 703	Natural Resource Economics and Management	ELECTIVE	2	2	30	70	50	150	3(2+1)
AG D 704	Visuals and Graphic Communications	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 705	Govt. Policies and Priogrammes on Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 706	Sampling Techniques	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 707	Dairy Cattle Production	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 708	Poultry Production and Management	ELECTIVE	1	4	30	70	50	150	3(1+2)
TOTAL			**6**	**24**				**1200**	**18**
***A student has to opt for six courses of 18 credits out of eight listed in any one of the group.**									
***Passing marks will be 40% for individual paper and 50% in a semester aggregate**									

EIGHTH SEMESTER

EIGHTH SEMESTER COURSES (RAWE:RURAL AGRICULTURAL WORK EXPERIENCE))

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 801	Research Station/KVK/ including village attachment and In-situ interaction offarmers, students and research station scientists	SEC	0	12	-	-	300	300	6(0+6)
AG 802	In-situ interaction of farmers, college faculty and students	SEC	0	4	-	-	100	100	2 (0+2)
AG 803	Educational Tour	SEC	0	4	-	-	100	100	2(0+2)
AG 804	Project Report Preparation and Evaluation	SEC	-	-	-	-	-	-	Non Credit
AG 805	Industrial Attachment*/Skill Development/ Experiential Learning Courses	SEC	0	24	-	-	400	400	8(0+8)
TOTAL				**44**				**900**	**18**
GRAND TOTAL									**165**

*** Credit Definition: One credit is defined as one-hour for lecture, 2 hours practical work per week.**

***The minimum credit requirement for the graduate degree should be 160 credits excluding non-credit courses for language, physical education/NCC/NSS**

***AECC: Ability Enhancement Compulsory Course**

***SEC: Skill Enhancement Course**

***L:Lecture Hours/Week**

B. Sc. Agriculture (Hons.)

FIRST SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 101	Introductory Agriculture and Principles of Agronomy	CORE	2	2	30	70	50	100	3(2+1)
Ag 102	Principles of Genetics	CORE	2	2	30	70	50	100	3(2+1)
AG 103	Introduction to Soil Science	CORE	2	2	30	70	50	100	3(2+1)
AG 104	Dimensions of Agricultural Extension	CORE	1	2	30	70	50	100	2(1+1)
AG 105	Agricultural Microbiology	CORE	2	2	30	70	50	100	3 (2+1)
AG 106	Elementary Mathematics	AECC	2	0	30	70	-	100	2(2+0)
AG 107	Comprehensive and Communication Skills in English	AECC	2	2	30	70	50	100	3(2+1)
AG 108	Introduction to Computer Applications	SEC	1	2	30	70	50	100	2(1+1)
AG 109	NCC/NSS	GENERIC	-	-	-	-	-	-	-
TOTAL			**14**	**14**	**240**	**560**	**350**	**1150**	**21**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

AG101: Introductory Agriculture and Principles of Agronomy 3 (2+1)

Theory:

Definition and importance of Agriculture; Meaning and scope of Agronomy; Plant growth and development– concept and differences; general growth curves, factors affecting crop production, Classification of crops; Meaning and types of tillage and tilth; Soil fertility and productivity ; Soil erosion- nature, extent and types; Soil conservation- meaning , agronomic and common mechanical practices; Agro-climatic zones of Rajasthan and India and National, International Agricultural Research Institutes in India and abroad. Art, science and business of crop production; Agricultural heritage; Chronological agricultural technology development in India; Ancient Indian Agriculture in Civilization Era; Conversion of man from food gatherer to food producer; Development of Agriculture through Kautilya`s work; Tools to predict monsoon rain; Plant protection in ancient and medieval India; Forest management and products, history of some indigenous trees.

Practical:

Identification of crop seeds and plants; Identification of fertilizers and manures; Acquaintance with farm tools and implements; Methods of ploughing and sowing; Preparation of seed beds of crops; Calculation on plant population ; Calculation of soil and water losses from runoff plots ; Identification of grasses, legumes and trees for soil conservation.

References:

1. De, Gopal Chandra 1989, Fundamentals of Agronomy. Oxford & IBH Publishing Co., New-Delhi.
2. ICAR 1989 Handbook of Agriculture, Indian Council of Agricultural Research, New-Delhi
3. Michael, A.M. and Ojha, T.P. 1986. Principles of Agricultural Engineering, Vol.II Jain Brothers, New
   Delhi.
4. Morachan, Y.B. 1986, Crop production and management, Oxford & IBH Publishing Co., New-Delhi.
5. Porwal, B.L. and Sharma, D.D. 1991. Sashya Vigyan Ke Adhunic Siddhant (Hindi) Alka Publishers, Ajmer.
6. Darashikoh – Nuskha Dar Fanni – Falahat (The Art of Agriculture). Translated from Persian to English
   by Razia Akbar (2000) with commentaries by K.L. Mehra, K.L. Chadhan, J.S. Kanwar and Y.L. Nene. Asian Agri- History Foundation, Secunderabad, Bull No. 3, pp : 136.
7. Kashyapa – Kashuliya Krishisukti (A Treatise on Agriculture by Kashyapa). Translated from Sanskrit to English by S.M. Ayachit (2002) with commentaries by Nalini Sadhale and Y.L. Nene, Asian Agri-History Foundation, Secunderabad, Bull No. 4. pp : 168.

AG102: Principles of Genetics 3 (2+1)

Theory:

History of Genetics, ultra structure of cell. Cell organelles and their function. Chromosomes structure, function and their chemical composition-karyotype and ideogram. Cell division: types and their significance. Mendel's law of inheritance. Gene interaction and their types. Multiples alleles and some classical examples. Inheritance of qualitative and quantitative characters and difference between them. Multiple factor hypothesis.Pleiotropism, penetrance and expressivity. Mechanism of crossing over and cytological proof of crossing over. Linkage types and importance. Estimation of linkage. DNA and its structure, function, types, mode of replication and repair. RNA and its structure,function and its types, transcription,translation,genetic code and protein synthesis.cytoplasmic inheritance-its characteristics features and difference between chromosomal and cytoplasmic inheritance.Structural chromosomal aberrations.Numerical chromosomal aberrations(polyploidy) and evolutionof different crop species like cotton,wheat,tobacco and brassicas.Mutation -characteristics , classification and induction.

Practical:

Introduction to microscopy-simple and compound microscope. study of typical plant cell. Preparation and use of fixatives and stains. Preparation of micro slides and identification of various stage of cell division. Monohybrid ratio and its modification. Test of goodness of fit of genetic ratio. Study of different types of gene interaction and modifications of typical dihybrid f2 ratio. Study and detection of linkage in f2 and test cross progeny. Demonstration of structural aberrations and polyploidy.

References:

1. Gupta P.K.2004. Cytology, Genetics and evolution. Rastogi Publications, Meerut. (Hindi Edition)
2. Kaushik, M.P.2003. A text Book of Modern Botany. Prakash publications, Muzaffar nagar(UP)
3. Klug, W.W.AndCummings, M.R.2005.Concepts of genetics Pearson Education (Singapore) pvt. Ltd.
4. Strickberger, M.W.2001.Genetics. Prentice Hall of India. Pvt. Ltd., New Delhi.
5. Shekhawat, A.S.andTripathi, B.K., 2009. A practical manual on Element of Genetics. Publish by College of Agriculture, Bikaner.

AG103: Introduction to Soil Science 3(2+1)

Theory:

Soil: Pedological and edaphological concepts. Origin of the earth, Earth's crust, Composition, Rocks and minerals. Weathering, Soil formation factors and processes, Components of soils. Soil profile, Soil physical properties, Soil texture, Textural classes, Particle size analysis, Soil structure, Classification, Soil aggregates, significance, Soil consistency, Soil crusting, Bulk density and particle density of soils & porosity and their significance and manipulation. Soil colour, Soil water, Retention and potentials, Soil moisture constants, Movement of soil water, Infiltration, Percolation, Permeability, Drainage. Methods of determination of soil moisture.Thermal properties of soils, Soil temperature, Soil air, Gaseous exchange, Influence of soil temperature and air on plant growth. Soil colloids: Properties, nature, types and significance; Layer silicate clays, and sources of charges. Adsorption of ions, Ion exchange, CEC & AEC, Soil reaction and buffering capacity. Factors influencing ion exchange and its Significance. Problem soils – acid, salt affected and calcareous soils, characteristics. Reclamation – mechanical, chemical and biological methods. Irrigations water – Quality of irrigation water and its appraisal. Indian standards for water quality. Use of saline water for agriculture.

Practical:

Collection and processing of soil sample. Identification of rocks and minerals. Determination of bulk density and particle density, Soil moisture determination, Soil moisture constants – Field capacity, permanent wilting point, Water holding capacity Infiltration rate, Soil texture and mechanical analysis, Soil temperature, Soil analysis for CEC, pH, EC, soluble cations & anions.

References:-

1. Sharma, N.L. & Singh, T.B. (1996) Soil Science (Hindi ed.) Rama pub. House, Barot Merrut (U.P)
2. Baver, L.D. Gardener, W.H. and gardener W.R.(1976) Soil Physics Wiley Eastern Ltd, New Delhi
3. Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science.Tata McGraw Hill publishing Co. Ltd, New Delhi
4. Brady, N.C. and Weil, R.R. (2002) The nature and properties of soils, prentiee hall of India Pvt. Ltd, M-97, Connaught Circus, New Delhi

5. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi
6. Rai, M.M. (2002) Principal of Soil Science Mac Millan India Ltd, New Delhi
7. Mehra R.K. (2004) Text book of Soil Science, ICAR, New Delhi
8. ISSS (2002) Fundamentals of Soil Science, Div. of Soil Science, IARI, New Delhi
9. Chopra S.L. and Kanwar, J.S. (1991) Analytical Agricultural Chemistry, Kalyani publisher, Ludhiana
10. Jackson, M.L. (1973) Soil chemical analysis, Prentice Hall of India, Pvt. Ltd New Delhi
11. Piper, C.S. (1950) Soil and plant analysis. .Hans publications, Bombay
12. Richards, L.A. (1960) Diagnosis and improvement of saline and alkali soils., USDA agriculture Hand book 60, Washington D.C., USA
13. Gupta, I.C. & Sharma, S.K. (1988) Crop production in salt affected soils, Oxford and IBH Publication, New Delhi.
14. Agrawal, R.R., Yadav, J.S.P. & Gupta, R.N. (1982) Saline and alkali soils of India. ICAR, New Delhi.

AG104: Dimensions of Agricultural Extension 2(1+1)

Theory:

Education- Meaning, Definition, Types-Formal, Informal and Non-formal Education. Extension Education - Meaning, Definition, Concept, Objectives, Principles, Scope and Importance. Development programmes of pre-independence era – Sriniketan, Marthandam, Gurgaon experiment and Gandhian constructive programme with special reference to year of start, objectives and activities. Development Programmes of post-independence era-Etawah Pilot Project, Community Development Programme–Meaning, Definition, Concept, Objectives, Difference between Community Development and Extension Education, National Extension Service. Panchayati Raj System/Democratic Decentralization/Three tiers system of Panchayati Raj–Concept,Meaning, Organizational set-up and Functions. Agricultural Development Programmes with reference to year of start, objectives & salient features- Institution Village Linkage Programme (IVLP), National Agricultural Technology Project (NATP), ATMA, ATIC, KVK & NAIP. Poverty Alleviation Programmes- Integrated Rural Development Programme (IRDP), Swarna Jayanti Gram Swarojgar Yojana (SGSY),National Rural employment act (NREGA). Reorganized Extension System (T & V System) – Concept & Methodology.

Practical:

Visit to KVK/ Extension Wing/ ATIC/ ATMA to study their functioning. Visit to Panchayati Raj Institutions to study the functioning of Gram Panchayat (GP) & Other Institutions. Visit and study the District Rural Development Agency (DRDA). Visit to a village to study the Self Help Groups (SHG). Visit to a voluntary organization to study the developmental activities. Organizing PRA techniques in a village to identify the agricultural problems.

References:

1. Dhama, O.P. & Bhatnagar, O.P.1985. Education and Communication for Development, Oxford & IBH Publishing Co. New-Delhi.
2. Kelsey, L.D. & Hearne, C.C. 1963. Cooperative Extension Work: Cornell University Press, New York, USA.
3. Ray, G.L. 2003. Extension Communication and Management, Naya Prakash, 206 Bidhan Sarni, Calcutta-6.
4. Reddy, A.A. 1993. Extension Education, Shri Laxmi Press, Baptala

AG105:Agricultural Microbiology 3 (2+1)

Theory:

History of microbiology: Theory of spontaneous generation, role of microbes in fermentation, germ theory of disease, protection against infections. Applied areas of microbiology, Metabolism in bacteria: ATP generation, chemoautotrophy, photoautotrophy, respiration, fermentation. Bacteriophages: structure and properties - Lytic and lysogenic cycles: viroids, prions. Bacterial genetics: Genetic recombination, transformation, conjugation and transduction. Genetic engineering, plasmids, episomes, genetically modified organisms. Soil microbiology: microbial groups in soil; microbial transformations of carbon, nitrogen, phosphorus and sulphur; Biological nitrogen fixation. Plant microbe interaction.Rhizosphere and phyllosphere microflora. Beneficial microorganism in agriculture: biofertilizers – Rhizobium, mycorrhiza, azolla; microbial insecticides, microbial agents for control of plant diseases .Microbes in composting. Microbiology of water: marine water, fresh water, potable water; Food microbiology: microbial spoilage and food preservation. Biodegradation of pesticides.Biogas production.

Practical:

Acquaintance with equipments, glasswares *etc*. in microbiology laboratory. Acquaintance with microscope. Disinfection and sterilization methods. Preparation of culture media for fungi and bacteria. Isolation of microbes from infected plant parts. Isolation and purification of bacteria by streak plate method. Staining and slide preparation of fungi. Staining of bacteria- simple and differential staining. Staining of endospore. Determination of quality of milk sample by methylline blue reductase test. Enumeration of bacteria present in soil and water.

References:

1. Biswas, T.D. and Mukherjee, S.K. 1990. Text Book of Soil Sciences, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Mukherjee, N. and Ghosh T. 1998. Agricultural Microbiology, Kalyani Publishers, New Delhi.
3. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R. 1997. Microbiology. Tata McGraw - Hill Edition, 1993. India.
4. Rangaswami, G. and Bagyaraj, D.J. 1993. Agricultural Microbiology. Prentice Hall of India Pvt. Limited, New Delhi.
5. Rao, N.S. 2000. Soil Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Vishunavat, K. and Kolte, S.J. 2005. Essentials of Phytopathological Techniques. Kalyani Publishers, New Delhi

AG106: Elementary Mathematics 2(2+0)

Theory

Elementary idea of complex number. Arithmetic and Geometric progressions. Elementary idea of permutation and combinations. Binomial theocrem for positive integral index, any index and their applications, addition and substraction formulae. A, B and C, D formulae. Sine and Cosine formulae. Inverse Trignometric functions. Introduction to matrices and determinants, special type of matrices, addition, substraction and multiplication of matries. Inverse of a matrix solution of system of linear equations using Cramer's rule and matrices method. Measures of central tendency and dispersion. Correlation and Regression. Elementary idea of probability theory.

AG107: Comprehensive and Communication Skills in English 3 (2+1)

Theory:

Grammar & usage i.e.Tense, Modals, Active & Passive voice, Direct & Indirect Speech, Question Tags, Determiners, Comprehension i.e. The Solitary Reaper : William Wordsworth, Mending Wall: Robert Frost, Of Studies: Francis Bacon, The Luncheon: W. S. Maugham.

Practical:

Composition i.e. Paragraph Writing, Letter Writing: Personal/Business Correspondence, Covering Letter and C.V. Writing, E-Mails Writing

Reference:

1. English for Competitive Examinations, Prof. R.P.Bhatnagar, Macmillan Publications.
2. "Current English Grammar and Usage with Composition" by R.P. Sinha, Oxford University Press (New Delhi).
3. Communication Skills by Sanjay Kumar&Pushp Lata. Oxford University Press (New Delhi)
4. Michal Swan (1995): 'A Practical English Grammar' OUP Publication

AG108: Introduction to Computer Applications 2(1+1)

Theory:

Historical Evolution of Computers, Computer System Concepts, Capabilities and Limitations, Types of computer: Analog, Digital, Hybrid, General Purpose, Special Purpose, Micro, Mini, Mainframe, Super, Generations of Computers, Type of PCs- Desktop, Laptop, Palmtop etc. their Characteristics, Computer Security, Basic Components of Computer System CPU, Input/Output and Memory, their Functions and Characteristics. Memory-RAM, ROM, EPROM, PROM and other type of Memory, Keyboard, Mouse, Digitizing Tablets, Scanners, Digital Cameras, MICR, OCR, OMR, Bar Code Reader, Voice Recognition, Light Pen, Touch Screen, Input/Output Devices, Monitors-Analog, Digital and Characteristics-size, Resolution, Video Standard-VGA, SVGA, XGA etc. Printers-Dot Matrix, Inkjet, Laser, Line Printer, Plotter, Sound Card and Speakers, Various Storage Devices- Magnetic Tape, Magnetic Disk, Cartridge Tape, Hard Disk Device, Floppy Disk, Optical Disk-CD, VCD, CD-R, CD-RW, DVD, Zip Drive, MS-Windows: Introduction to MS-Windows, Concept of GUI, Desktop and its elements, Windows explorer, Control Panel, Accessories, Running Application under MS Windows, Advantages and Limitation of Windows, various Versions of windows Like (Win 95,98,Win ME, 2000 XP), Hardware requirement for Windows XP, Basic concept of MS Word Processor, MS Excel, MS Power Point, Features of word processing packages, MS Excel packages, Power Point Package. Internet: world Wide Web (WWW), Concept, Web Browsing and Electronic Mail, concept of Networking.

Practical:

Study of Computer Components; Booting of Computer and its Shut Down; Practicing WINDOWS Operating System, Use of Mouse and Keyboard, Title Bar, Start Menu, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars; Setting time and date, Starting and Shutting down of Window, WINDOWS Explorer, Creating File and Folders, COPY and PASTE functions, MS-Word: Introduction to MS Word. Creating a Document, Saving and Editing, Word Proofing Tools-Using Spelling Checker, Working with Grammar Checker, Using Thesaurus, Working with Auto Text Feature in Word, Using Auto Correct Feature, Word Count. Text Formatting, Document Formatting (Page Formatting), Alignment of text, Creating Tables, Merging of Cells, Column and Row width and Chart in Word, Working with Mail Merge, Graphics and Web Pages in word, MS-Power Point**:**

Introduction to MS Power Point. Power Point Slide Creation, Slide Show, Editing, Animation, Adding a Picture, Adding Graphics, Formatting, Customizing, Printing and Other inbuilt Additional Function. **MS Excel:** Introduction to MS Excel. Creating a Spreadsheet, Editing and saving. Working with Toolbars, Formatting, Formulas, Data Management, Graphs & Chart, Macros, Goal Seek Pivot Table, Financial Functions and Other inbuilt Additional Function. Data Analysis using inbuilt Tool Packs, Correlation & Regression. Internet Browsing: Browsing a Web Page and Creating of E-Mail ID.

Reference:

1. Sinha, P.K. Computer Fundamentals (BPB Publications).
2 Niranjan Mansal and Jayshri Saraogi Computer Made Easy For Beginners (Hindi)
3 Satish Jain, Shashank Jain and Madhullika Jain. It Tools and Applications (BPB Publications)
4 MS Office 2000. Joe Habraken
5 Rapidex Computer Course (Pustak Mahal)
6 Davinder Singh Minhas- Dynamic Memory Computer Course (Fusin Books), New Delhi.

AG109: NCC/NSS/ Physical Education 1(0+1)

NSS: Orientation of students in national pprogrammes, study of philosophy of NSS, fundamental rights, directive principles of state policy, socio-economic structure of Indian society, population problems, brief of five year plan. Functional literacy, non formal education of rural youth, eradication of social evils, awareness programmea, consumer awareness, highlights of consumer act. Environment enrichment and conservation, health, family welfare and nutrition.

NCC: Introduction to NCC, defence services, system of NCC training, foot drill, sizing, forming up in three ranks, open and close order march, dressing, getting on parade, dismissing and falling out, saluting, marching, arms drill, shoulder arm, order arm, present arm, guard of honour, ceremonial drill, weapon training- rifle bayonet, light machine gun, sten machine carbine. Introductionand characteristic stripping, assembling and cleaning, loading, unloading and firing. Field craft, visual training, targets, judging distance, fire discipline and fire control orders, battle craft, field signals, description of ground, section formation, section battle drill, scouts and patrols, ambush, field engineering, map reading, conventional signs, grid systems, use of service protractor, prismatic compass and its use, self defence, general principles, precautions and training, attacks and counter attacks, marching and searching, first aid, hygine and sanitation, civil defence, leadership and NCC song.

Physical Education: Introduction to physical education. Posture, exercise for good posture, physical fitness exercises agility, strength, coordination, endurance and speed. Rules and regulations of important games, skill development in any one of the games- football,hockey, cricket, volleyball,, badminton, throw ball, tennis. Participation in one of the indoor games- badminton, chess and table tannis. Rules and regulations of athletic events, participation in any one of the athletic events- long jump, high jump, triple jump, javlin throw, discuss throw, shot put, short and long distance runnings. Safety education, movement education, effective way of doing day to day activities. First - aid training, coaching for major games and indoor games. Asans and indigenous way for physical fitness and curative exercises. Exercises and games for leisure time, use and experiences.

SECOND SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 201	Agricultural Meteorology	CORE	1	2	30	70	50	150	2 (1+1)
AG 202	Principles of Plant Breeding	CORE	2	2	30	70	50	150	3(2+1)
AG 203	Plant Pathogens and Principles of Plant Pathology	CORE	3	2	30	70	50	150	4 (3+1)
AG 204	Insect Morphology and Systematics	CORE	2	2	30	70	50	150	3 (2+1)
AG 205	Principles of Agricultural Economics	CORE	2	0	30	70	-	100	2 (2+0)
AG 206	Fundamentals of Soil and Water Conservation Engineering	CORE	1	2	30	70	50	150	2(1+1)
AG 207	Biochemistry	CORE	2	2	30	70	50	150	3 (2+1)
AG 208	Soil Chemistry, Soil Fertility and Nutrient Management	CORE	1	2	30	70	50	150	2(1+1)
AG 209	NCC/NSS	GENERIC	-	-	-	-	-	-	-
TOTAL			**14**	**14**	**240**	**560**	**350**	**1050**	**21**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

AG201: Agricultural Meteorology 2(1+1)

Theory:

Atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Daily and seasonal variation of wind speed and direction, cyclones, anticyclones and air masses; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave and thermal radiation ,net radiation, albedo; Atmospheric temperature, daily and seasonal variations of temperature, heat balance of earth and global warming; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, snow, rain and hail; Precipitation, cloud formation and movement; Agriculture and weather relations; Introduction to monsoon; Use of weather data for irrigation scheduling, pesticide sprays, fertilizer application; Climatic normals for crop production, Basics of weather forecasting.

Practical:

Agro-meterological observatory – its site selection, installation and exposure of instruments, weather data recording; Measurement of total solar radiation, short wave and long wave radiation, albedo and sunshine duration; Maximum and minimum air temperature, soil temperature, dew point temperature; Determination of vapor pressure, relative humidity, atmospheric pressure, wind speed and wind direction; Measurement of rain, open pan evaporation and evapo-transpiration; Processing, tabulation and presentation of weather data.

References:

1. Sacheti,A.K. 1985. Agricultural Meteorological Instructional Cum Practical Manual (Ed.) NCERT
   Publication, New Delhi.
2. Mavi, H.S. 1994, Introduction to Agrometeorology, Oxford & IBH Publishing Co., New Delhi.
3. Lal, D.S. 2005 Climatology, Sharda Pustak Bhawan, Allahabad..
4. Barry ,R.G. and Chorley, R.C. 1985. Atmosphere Weather and Climate. English Language Book Soc.
   Publication.
5. Varshneya, M.C. and Balakrishna, Pillai, 2003. Text book of Agricultural Meteorology. ICAR, New-

Delhi.

6. Sahu, D.D., 2003. Agrometeorology and Remote sensing: Principles and Practices , Agrobios (India) , Jodhpur.
7. Murithy, K, and Radha, V. 1995. Practical Manual on Agricultural Meteorology , Kalyani Publishers, New-Delhi

AG202: Principles of Plant Breeding 3(2+1)

Theory:

Introduction to ecological and taxonomical classification of plants. Historical development, nature and role of plant breeding. Modes of reproduction (Sexual, asexual and vegetative) and their relation with plant breeding. Fertility regulatory mechanisms (incompatibility, male sterility and apomixes),their classification and importance in plant breeding. Inheritance of qualitative and quantitative characters and heritability. Pure line theory and genetic basis of selection. Hardy- Weinberg law. Heterosis and theories of Heterosis and inbreeding depression. Germplasm resources and center of diversity. Domestication, introduction and acclimatization in relation to plant improvement. Improved genotypes of different crop plant- variety, Different breeding methods of their development. Inbred line, different hybrids, synthetic, composite, multiline, clone, etc Polyploidy in relation to plant breeding. Mutation breeding –types, role and methods of mutation breeding. Use of biotechnology in plant breeding. Procedure for release of new variety.

Practical:

Identification of plants of different ecological groups. Floral biology of different crop plants. T.S. of ovary. Mounting of different types of ovules. Study of microsporogenesis and megasporogenesis. Study of pollen viability. Study of pollen size. Emasculation and hybridization techniques in important self and cross pollinated crops. Study of male sterility in sorghum/bajra. Calculation of mean, range, variance and standard deviation.

References:

1. Alard, R.W. 2000.Principles of Plant Breeding. John Willey & Sons, New York.
2. Chahel, G.S. and S.S. Ghosal.2002.Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
3. Singh, B.D. 2005. Plant Breeding. Kalyani Publishing House, New Delhi.
4. Singh, P. 2001.Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.
5. Jain, H.K. and M.C. Kharackwal.2004. Plant Breeding- Mendelian to Molecular approach. Narosa Publishing House, New Delhi.

AG203 : Plant Pathogens and Principles of Plant Pathology 4 (3+1)

Theory:

Introduction, Important plant pathogenic organisms, different groups, fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viriods, algae, protozoa and phanerogamic parasites with examples of diseases caused by them. Prokaryotes: classification of prokaryotes according to Bergey's Manual of Systematic Bacteriology. General Characters of fungi, Definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction in fungi (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to kingdoms and phylum, Introduction: Definition and objectives of Plant Pathology. History of Plant Pathology. Terms and concepts in Plant Pathology. Phenomenon of infection - pre-penetration, penetration and post penetration. Pathogenesis – Role of enzymes, toxins, growth regulators and polysaccharides. Defense mechanism in plants – structural and biochemical. Plant disease epidemiology. Plant Disease Forcasting - Remote sensing - General principles of plant diseases management - Importance, general Principles - Avoidance, exclusion, protection - Plant Quarantine and Inspection -Quarantine Rules and Regulations. Cultural methods - Rougeing, eradication of alternate and collateral hosts, crop rotation, manure and fertilizer management, mixed cropping, sanitation, hot weather ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage. Role and mechanisms of biological control and PGPR classification of fungicides and their uses. Host plant resistance – Application of biotechnology in plant disease management -Development of disease resistant transgenic plants through gene cloning. Integrated plant disease management (IDM) - Concept, advantages and importance.

Practical:

Acquaintance to plant pathology laboratory and equipments; Preparation of culture media for fungi and bacteria; Isolation techniques, preservation of disease samples; Study of Pythium, Phytophthora and Albugo; Study of Sclerospora, Peronosclerospora, Pseudoperonospora, Peronospora, Plasmopara and Bremia; Study of genera Mucor and Rhizopus. Study of Oidium, Oidiopsis, Ovulariopsis, Erysiphe, Phyllactinia, Uncinula and Podosphaera; Study of Puccinia (different stages), Uromyces, Hemiliea; Study of Sphacelotheca, Ustilago and Tolyposporium; Study of Agaricus, Pleurotus and Ganoderma; Study of Septoria, Colletotrichum, Pestalotiopsis

and Pyricularia; Study of Aspergillus, Penicillium, Trichoderma, and Fusarium; Study of Helminthosporium, Drechslera, Alternaria, Stemphyllium, Cercospora, Phaeoisariopsis, Rhizoctonia and Sclerotium; Demonstration of Koch's postulates. Preparation of fungicides – Bordeaux mixture, Bordeaux paste. Chestnut compounds; Methods of application of fungicides – seed, soil and foliar. Visit of quarantine station and remote sensing laboratory.

References:

1. Agrios, G.N. 1996. Plant Pathology, Academic Press, New Delhi.
2. Alexopolus, C.J., Mims, C.W. and Blackwell, M. 1996. Introductory Mycology, John Wiley Estern Private Limited, New York.
3. Mehrotra, R.S. and Aggarawal, A. 2007. Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
4. Singh, R.S. 1996. An Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.
5. Nene Y.L. and Thapliyal, P.N. 1993. Fungicides in Plant Diseases Control. 3rd Edn. Oxford & IBH published Co. Pvt. Ltd., New Delhi.

AG204: Insect Morphology and Systematics 3 (2+1)

Theory:

History of Entomology in India. Factors for insect dominance. Classification of phylum Arthropoda upto classes. **Morphology:** Structure and functions of insect cuticle and moulting. Body segmentation; structure of head, thorax and abdomen of grasshopper. Structure and modifications of insect antennae, mouth parts and legs. Wing venation, modifications and wing coupling apparatus. Sensory organs. Metamorphosis in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (endocrine) and reproductive systems in grasshopper. Types of reproduction in insects. **Systematics:** Taxonomy -importance, history and binomial nomenclature. Definitions of species, sub-species sibling species and biotype, Classification of class Insecta up to families:

Orthoptera- Acrididae

Isoptera- Termitidae Thysanoptera- Thripidae

Hemiptera-Pentatomidae,Coreidae,Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Aleurodidae, Pseudococcidae

Lepidoptera- Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae

Coleoptera- Coccinellidae, Galerucidae, Cerambycidae, Curculionidae, Bruchidae, Melonthidae Hymenoptera-Tenthridinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae

Diptera- Cecidomyiidae, Trypetidae, Tachinidae, Agromyzidae. Dictyoptera- Mantidae, Blattidae

Practical:

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Cockroach; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus; Dissection of digestive and nervous system in insects; Study of characters of orders Orthoptera, Dictyoptera, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

References:

1. Nayar. K.K, Ananthakrishnan .T.N. and David. B.V. 1976. General and Applied Entomology. Mc graw Hill publishing Co. Ltd. New Delhi.
2. Richards O.W. and Davies R.G. 1977. Imm's General Text Book of Entomology, Vol. I & II. Chapman and Hall, London**.**
3. Pant. N.C. and Ghai, S. 1981. Insect Physiology and Anatomy, ICAR, New Delhi.
4. Chapman .R.F.1974. Insect Structure and Function, ELBS Publishers New Delhi.
5. Snodgrass.R.E .2001. Principles of Insect Morphology.
6. Mathur and Upadhyay, 2000. A Text Book of Entomology, Aman Publishing House, Meerut.

AG205: Principles of Agricultural Economics 2 (2+0)

Theory:

Meaning, definition, subject matter, Division and Importance of economics. Meaning, definition of Agricultural Economics. Basic concepts of goods, service, utility, value, price, wealth & welfare economics. Meaning, characteristics, importance and classification of wants. Theory of consumption. Law of diminishing marginal utility – meaning & importance. Demand - meaning, definition and kinds of demands, Demand schedule and demand curve. Law of demand - extension and contraction Vs increase and decrease in demand. Elasticity of demand – meaning and definition, types of elasticity of demand, degree of price elasticity of demand, Method of measuring elasticity – factors influencing elasticity of demand and importance of elasticity of demand. Laws of supply – meaning & definition, supply schedule, supply curve, elasticity of supply and factor influencing in elasticity of supply. National income–concepts & measurement. Meaning and classification of taxes and cannons of taxation. Inflation- meaning, definition, kinds of inflation .

References:

1. K.K. Dewett and J.D. Verma (1986) Elementary Economic Theory, S.Chand & Company, New Delhi
2. P.A. Samuelson & W.D. Nordhaus (1987) Economics, McGraw-Hill, Singapore
3. S.K. Mishra and V.K. Puri (1996) Indian Economy, Himalaya Publishing House, New Delhi
4. G.B. Jathar and S.G. Beri (1996) Elementary Principles of Economics, Oxford University Press (10th Edition), Delhi
5. Berkeley Hill (1980) An Introduction to Economics for students of agriculture, Pergaman Press, Oxford

AG206: Fundamentals of Soil and Water Conservation Engineering 2(1+1)

Theory:

Classification of irrigation projects and components of canal system; Ground water sources-types of aquifers; Centrifugal pumps; Measurement of irrigation water; Water conveyance system; Pressurized irrigation methods-sprinkler and drip; Soil erosion- types and factors affecting soil erosion; Brief description about erosion control structures for agricultural lands; for non-agricultural, denuded and wastelands; Temporary gully control structures.

Practical:

Power calculation for pumps; Field measurement of irrigation water; Design of open channels; Determination of fertilizers doses, uniformity coefficient and capacity of a sprinkler irrigation system; Visit to farmers adopting sprinkler and drip irrigation systems; Visit to watershed areas.

References:

1. Lehninger AL (2004). Principles of Biochemistry, Freeman and Company, USA
2. Conn EE, Stumpf PK, Bruining G and Doi RH (2007). Outlines of Biochemistry. John Wiley and Sons, New York
3. Nelson DL and Cox MM (2000). Lehninger Principles of Biochemistry 3rd edn, Printed in India by Replica Press Pvt. Ltd., New Delhi for Worth Publishers, New York.
4. Goodwin, TW and Mercer EI (1998). Introduction to Plant Biochemistry, Progamon Press Inc. Deffered UK
5. De Robertis EDP and De Robertis EMF (2006). Cell and Molecular Biology, B I Publications Pvt Ltd, New Delhi
6. Sahney SK and Singh RR (2002). Introductory Practical Biochemistry, Narosa Publishing House, New Delhi
7. Yadav VK and Yadav N (2007). Biochemistry and Biotechnology-A Laboratory Manual, Pointer Publishers, Jaipur

AG207: Biochemistry 3 (2+1)

Theory:

Biochemistry – Introduction and importance. Plant cell, cell wall and its role in livestock, food and paper industries. Structure, properties & applications of biomolecules: amino acids, peptides and proteins. Plant proteins and their quality. Enzymes – classification, factors affecting the activity, immobilization and other industrial applications. Lipids – classification, properties and their industrial application in soaps, paints, lubricants, plastics including biodegradable plastics, bio-diesel etc. Carbohydrates – classification, structure and functions. Nucleotides and nucleic acids. Metabolism – basic concepts, glycolysis, citric acid cycle, pentose phosphate pathway, oxidative phosphorylation and fatty acid oxidation. General reactions of amino acids. Biosynthesis – carbohydrates, lipids, proteins and nucleic acids. Metabolic regulation. Secondary metabolites - terpenoids, alkaloids, phenolics and their applications in food and pharmaceutical industries.

Practical:

Preparation of standard solutions and buffers. Determination of pH. Qualitative tests for carbohydrates, lipid, amino acids and proteins. Identification of plant pigments by paper chromatography. Thin layer chromatography of lipids. Assay of enzyme and effect of pH. Demonstration of column chromatography. Extraction of oil from oil seeds. Quantitative determination of carbohydrates (sugars), proteins and phenols. Extraction of nucleic acids.

AG208: Soil Chemistry, Soil Fertility and Nutrient Management 2(1+1)

Theory:

Essential and beneficial elements, criteria of essentiality, forms of nutrients in soil, mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Measures to overcome deficiencies and toxicities, nutrient availability to plants in Acid, salt affected and calcarious soils: Concept of soil fertility, different approaches/methods for soil fertility evaluation -- Biological method. Plant analysis method: DRIS methods, critical levels in plants. Rapid tissue tests. Indicator plants. Soil analysis methods: critical levels of different nutrients in soil. Soil test based fertilizer recommendations to crops. Factors influencing nutrient use efficiency (NUE) in respect of N, P, K, S, Fe and Zn fertilizers. Integrated nutrient management.

Practical:

Analytical chemistry – Basic concepts, techniques and calculations, Principles of analytical instruments and their calibration and applications, Estimation of available N, P, K, S, Zn and Fe in soil, Estimation of N, P and K in plants.

References:

1. Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science.Tata McGraw Hill publishing Co. Ltd, New Delhi
2. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi
3. Rai, M.M. (2002) Principal of Soil Science, Mac Millan India Ltd, New Delhi
4. Mehra R.K. (2004) Text book of Soil Science, ICAR New Delhi
5. ISSS (2002) Fundamental of Soil Science Div. of Soil Science, IARI, New Delhi
6. Jackson, M.L. (1973) Soil chemical analysis, Prentice Hall of India, Pvt. Ltd New Delhi
7. Piper, C.S. (1950) Soil and Plant analysis, .Hans publications, Bombay
8. Singh Dhyan, Chhonkar, P. K. and Dwivedi V.S. (2005) Manul on Soil Plant and water analysis. Westville Publishing House, New Delhi
9. Tisdale, S.L. Nelson, W.L. Beaton, J.D. and Havlin, J.L. (1991) Soil fertility and fertilizers (5^{th} ed.).Prentice Hall of India, Pvt .Ltd, New Delhi.
10. Singh Vinay (1996) (Hindi) Soil Science, fertilizer & Manures , V.K. Prakashan Barot Merrut (U.P)

THIRD SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 301	Field Crops-I (*Kharif*)	CORE	2	2	30	70	50	150	3 (2+1)
AG 302	Weed Management	CORE	1	2	30	70	50	150	2 (1+1)
AG 303	Introductory Nematology	CORE	1	2	30	70	50	150	2 (1+1)
AG 304	Statistics	CORE	2	2	30	70	50	150	3(2+1)
AG 305	Fundamentals of Rural Sociology and Educational Psychology	CORE	2	0	30	70	-	100	2(2+0)
AG 306	Production Technology of Fruits and Plantation Crops	CORE	2	2	30	70	50	150	3(2+1)
AG 307	Production Economics and Farm Management	CORE	1	2	30	70	50	150	2 (1+1)
AG 308	Farm Power and Machinary	CORE	1	2	30	70	50	150	2(1+1)
AG 309	Manures And Fertilizers	CORE	1	2	30	70	50	150	2 (1+1)
AG 310	NCC/NSS	GENERIC	-	-	-	-	-	-	-
TOTAL			**13**	**16**	**270**	**630**	**400**	**1300**	**21**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

AG301: Field Crops-I (*Kharif*) 3(2+1)

Theory:

Origin, geographic distribution, importance, soil and climatic requirement**,** varieties; cultural practices *viz.* seed and sowing , intercultural operations, fertilizer, water and weed management, plant protection ; harvesting and yield of – rice, maize, sorghum, (grain and forage), pearl millet(grain and forage); pigeonpea, groundnut.soybean and cotton ; Package of practices of mungbean ,urdbean, cowpea, mothbean, clusterbean, sunhemp, castor, sesame, minor millets and napier .Acquaintance about *Panicum, Lasiura*s and *Cenchrus.*

Practical:

Rice nursery preparation ,seed bed preparation and sowing of *kharif* crops; Calculations on seed rate; Sowing of mungbean, pearl millet, and cotton; Effect of seed size on germination and seedling vigour ; Identification of weeds in pearl millet and other crops ; Fertilizer application and top dressing of nitrogen in pearl millet and study on fertilizer experiments ; Study of yield contributing characters, yield calculations, harvesting and yield estimation ; Study of crop varieties and important agronomic experiments

References:

1. Singh, Chhidda; Singh P. and Singh, R. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Singh, S.S. 1998, Crop Management: Under irrigated and rainfed conditions.
3. Singh, S.S. 1993, Principles and Practices of Agronomy, Kalyani Publishers, New Delhi. Reddy,T.Y. and Reddi, G.H.S. 1993. Principles of Agronomy, Kalyani Publishers, New Delhi.
4. Maiti, S. , Hedge,M.R. and Chhattopadhyay, S.B. 1988. Handbook of Annual Oil Seed Crops. Oxford & IBH Publishing Co., New Delhi.
5. Jaiswami, L.H. and Baldeo, B. 1990. Advances in Puulse Production Technology, ICAR, New Delhi. Thakur, C. 1979. Crop Production, Vol. I & II. Metropolitan Book Pvt. Ltd., New Delhi.
6. Ahlawat, I.P.S. , Sharma, O.P. & Saini., G.S. 1998 Scientific Crop Production in India. Aman Publishing House, Madhu Market, Budhana gate, Meerut.
7. Rathore, P.S. 1999-2000. Techniques and Management of Field Crop Production.

Agrobios (India), Jodhpur. Rathore, P.S. and Sharma, S.K. 2003. Scientific Pulse Production. Yash Publishing House, Bikaner.

8. Sharma, Kalicharan 1990 Bharat ki promokh faslea. G.B. Pant Agricultural & Technology University, Nanital. Reddy, S.R. 2004. Agronomy of Field Crops. Kalyani Publishers, New Delhi.

AG302: Weed Management 2(1+1)

Theory:

Weeds- introduction, harmful and beneficial effects, classification, propagation and dissemination; Weed biology and ecology, crop weed association, crop weed competition and allelopathy; Concepts of weed prevention, control and eradication; Methods of weed control- physical, cultural, chemical and biological methods; Integrated weed management; Herbicides- advantages and limitation of herbicide usage in India; Herbicide classification, formulations, methods of application; Introduction to Adjuvants and their use in herbicides; Introduction to selectivity of herbicides; Compatibility of herbicides with other agro chemicals; Weed management in major field crops. Aquatic weeds and their management.

Practical:

Identification of weeds; Preparation of herbarium of weeds; Study of crop weed competition ; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops; Biology of nut sedge, bermuda grass, *Parthenium* and *Celosia;* Economics of weed control practices; visits of problem areas (field).

References:

1. Gupta , O.P. 2005. Weed Management: Principles and Practices (2nd Ed) Agribios (India) Jodhpur.
2. Gupta, O.P. 2002 . Modern Weed Management , Agribios (India) Jodhpur.
3. Rao, V.S. 2000. Principles of Weed Science (2nd Ed) , Oxford & IBH Publishing Co., New-Delhi.
4. Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T. 2003. Weed Management , ICAR, New- Delhi.

AG303: Introductory Nematology 2(1+1)

Thoery:

History and economic importance of plant parasitic nematodes; Characters of Phylum Nematoda and systematic position of plant parasitic nematodes (outline classification upto Generic level); General morphology, ecology and biology; Plant nematode relationship; Kinds of parasitism and symptomology; Nematode interaction with other micro-organisms; Nematode diseases of crop plants of economic importance in State with special reference to *Meloidogyne* spp; *Heterodera avenae, Anguina tritici* and *Rotylenchulus reniformis* Tylenchulus *semipenetrans;* Principles of nematode management.

Practical:

Study of compound microscope alongwith other laboratory necessaries, Survey and Collection of soil and plant samples, extraction of nematodes from soil and roots, killing and fixing of nematodes, staining and separation of nematodes in plants tissue, preparation of temporary and semi-permanent mounts of nematodes, identification of important plant parasitic nematodes, collection and preservation of nematode diseased plant samples; Nematicides and their uses.

References

1. Reddy, P.P. (1993). A treatise on phyto nematology, Agricol. Publ. Academy, N. Delhi.
2. Walia, R.K. and Bajaj, H.K. (2003). Introduction plant Nematology, ICAR Publication, Krishi Bhawan, New Delhi.
3. Laboratory Manual of Elementary Nematology (Correspondence to course No. NEMAT-411) by Dr. R.L. Midha and Dr. G.L. Sharma (2007).

AG304: Statistics 3(2+1)

Theory:

Introduction: Definition of statistics by seligman and Horac Secrist. Aims, Scope and limitation of statistics. Classification: Definition and its type (According to attributes and class intervals). Measures of central tendency: A.M., G.M., H.M. median, mode, Properties of A.M. Merits, demerits and uses of above measures. Dispersion: range, M.D. Q.D., S.D., variance and c.v., Merits and demerits of above measures. Correlation and regression: scatter diagram, Karl pearson's correlation coefficient, Simple linear regression; regression lines and their fitting,

properties of correlation and regression coefficients. Probability and simple problems based on probability. Test of significance: Null and alternative hypothesis, two types of errors, level of significance, critical region, d.f. standard normal deviate test and students. t-test for single mean and difference between two means, paired t-test. Test of significance of correlation and regression coefficients. Chisquare test for Goodness of fit and fortesting independence of attributes, Yates correction (No mathematical derivatives).

Practical:

Preparation of frequency table of quantitative data. Computation of A.M. for raw data and frequency distribution by direct method and short cut method. Computation of G.M. and H.M. for raw data and frequency distribution. Computation of median and mode for raw data and frequency distribution. Computation of M.D.; Q.D. for raw data and frequency distribution. Computation of S.D. and C.V. for raw data and frequency distribution. Computation of correlation coefficient. Estimation of regression lines, t & S.N.D. test for single mean and difference between two means, paired t-test. Test of significance of correlation and regression coefficients. Chisquare test for Goodness of fit & test of independence in 2x2 contingency table and m x n contingency table.

References;

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

AG305: Fundamentals of Rural Sociology and Educational Psychology (2+0)

Theory :

Sociology and Rural Sociology- Meaning, Definition, Scope, Importance of rural sociology in Agricultural Extension and Interrelationship between Rural Sociology and Agricultural Extension. Indian Rural Society, Important characteristics, differences & Relationship between Rural and Urban societies. Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups. Social Stratification – Meaning, Definition, Functions, Forms of Social stratification. Cultural concepts - Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions - Meaning, Definition and their role in Agricultural Extension. Social Values and Attitude - Meaning, Definition, Types and Role of social values and Attitudes in Agricultural Extension. Social Institutions - Meaning, Definition, Major institutions in Rural society, Functions. Social Control - Meaning, Definition, Need and Means of Social control. Social change - Meaning, Definition, Nature of Social change and factors of social change. Leadership- Meaning, Definition, Classification, Roles of Leader, Methods of selection of leaders. Psychology and Educational psychology- Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension. Intelligence - Meaning, Definition, Types, Factors affecting intelligence. Personality- Meaning, Definition, Types, Factors influencing the Personality and Role of Personality in Agricultural Extension. Teaching- Learning process- Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics.

References:

1. Bhatia, H.R. 1965. A Text Book of Educational Psychology, Asia Publishing House, New Delhi.
2. Chitamber, J.B., 1990. Introductory Rural Sociology: Willey Easter Ltd. New Delhi.
3. Dhama, O.P. & Bhatnagar, O.P.,1985. Education & Communication for Development, Oxford and IBH Publishing Company, New Delhi,
4. Desai, A.R. 1953. Rural Sociology in India, Vora & Co. Publisher Pvt. Ltd., Bombay.
5. Pujari, D. 2002 Educational Psychology in Agriculture, Agrotech Publishing Academy, Udaipur (Raj.)

AG306: Production Technology of Fruit and Plantation Crops 3(2+1)

Theory:

Importance, introduction and scope of horticulture. Classification of fruits according to climate. Selection of site, planning, establishment and layout of orchard. Propagation methods of fruit crops. Methods of training and pruning in fruit crops. Use of growth regulators in fruit production. Package of practices for the cultivation of major fruits with the emphasis on botanical name, family, origin, distribution, climate, soil, varieties, propagation, planting, manures and fertilizers, irrigation, training and pruning, intercultural operation, harvesting, yield and plant protection measures including physiological disorders – mango, banana, citrus, grape, guava, sapota, apple, papaya, pineapple, pomegranate, ber, jack, aonla, bael, date palm; plantation crops -coconut, areca nut, cashew, oil palm and tea.

Practical:

Identification of fruit and plantation crops. Study of horticultural tools and implements and their uses; Plant propagation methods, by seeds, cuttings (soft wood, hard wood and semi-hardwood), budding and grafting, layering (simple layering, Air layering,); Layout and planting systems, Methods of pruning and training of important fruit crops .Irrigation methods in fruit crops including drip – Micro irrigation methods for establishment of orchard; Methods of fertilizer application in fruit crops. Visit to local commercial orchards with in state; Preparation of growth regulator solutions for propagation; Application of growth regulators for improving fruit set, fruit size and quality.

References:

1. Bose. T.K., Kabir.J., Das.P. and Joy.P.P.(2000)Tropical Horticulture. Naya Prokash. Calcutta
2. Singh, Amar (1986) Fruit Physiology And Production. Kalyani Publishers, New Delhi
3. Singh. S.P. (1997) Commercial Fruits. Kalyani Publishers, New Delhi
4. Mitra. S.K., Bose. T.K. and Rathore. D.S. (1991) Temperate Fruits. Horticulture Allie Publishers, Calcutta
5. Parthasvathy. V. A. Chattopadhyay. P.K. and Bose. T.K. (2006). Plantation Crpos. Naya Prokash, Kolkatta
6. Bal. J.S. (1997) Fruit Growing. Kalyani Publisher, New Delhi
7. Chandra, Atul and Chandra, Anju. Production and Post harvest technology of Fruits. NBS Publisher & Distributers, Bikaner

AG307: Production Economics and Farm Management 2 (1+1)

Theory:

Production Economics: Meaning, Definition, Nature and Scope of Agricultural Production Economics. Basic concepts and terms. Concepts of Production. Production Functions: Meaning, Definition, Types. Laws of returns: Increasing, Constant and decreasing. Factor Product Relationship. Determination of optimum input and output. Factor relationship. Product relationship. Types of enterprise relationships. Returns to scale: Meaning, Definition, Importance. Farm Management. Economic principles applied to the Organisations of farm business. Types and systems of farming. Farm planning and budgeting. Risk and uncertainty. Farm budgeting. Linear programming: Assumptions, Advantages and Limitations of Linear programming.

Practical:

Computation of cost concepts; Methods of computation of depreciation; Analysis of Net worth statement; Farm inventory analysis; Preparation of farm plans and budgets; Types of farm records and accounts; Preparation of profit and loss account; Break, Even analysis; Economics analysis of different crop and livestock enterprises; Application of Farm Management Principles.

References:

1. Mittal, S.K. and Sethi, C.P. “Linear Programming.”
2. Tandan R.K. and Dhondiyal, S.P. “Principles and Methods of Farm Management”.
3. Heady, E.O. and Candler, W. “Linear Programming Methods”.
4. Johl, S.S. and Kapoor, T.R. “Fundamental of Farm Business Management, Kalyani Publishers, Ludhiana and New Delhi.
5. Sankhayan, P.L. “Introduction to the Economics of Agricutural Production”.
6. Singh, I.J. “Elements of Farm Management”.
7. Dorfman, R. and Samuelson and Solow, R. “Linear Programming and Economic Analysis”.
8. Heady, E.O. and Dillors, J.L. “Agricultural Production Function”.
9. Karam, A.S. and Karan Singh “Economics of Farm Management in India”.

AG308: Farm Power and Machinery 2(1+1)

Theory:

Sources of farm power; Scope and development of farm mechanization; Elementary knowledge of principle, operation, types and components of I.C. engines; I.C. engine terminology and related numerical. Different systems of I.C. engines- Air supply and exhaust system; Fuel supply system; Lubricating system; Cooling system; Transmission system; Daily and periodic maintenance of tractors; Tractor driving; Numerical on field capacity and draw bar horse power requirements of implements; Primary tillage implements- tractor drawn mould board plough and disk plough; Secondary tillage implements- cultivators, harrows and hoes; Ferti-seed drill- parts and calibration (including numerical).

Practical:

Identification of engine parts; Study of air and fuel supply system; Study of lubricating and cooling system; Study of transmission system; Tractor driving; Daily and periodic maintenance of tractor; Study of tractor drawn mould board plough and disk plough; Study of different cultivators, harrows and hoes; Study and calibration of seed cum ferti- drill; Estimation of tractor operational cost;Numerical problems on field capacity, field efficiency and power requirement of implements; and numericals on engine terminology.

Reference:

1. Principles of Agricultural Engineering. Vol. I. 1987. Michael, A.M. and T.P. Ojha. Jain Brothers, Jodhpur.
2. Farm Tractors, Maintenance and Repair.1989. Rai and Jain. Tata Mc Graw Hill Publ. New Delhi.
3. Elements of Farm Machinery.1989. Srivastava, A.C. Oxford IBH Publ. Company, New Delhi.
4. Elements of Agricultural Engineering, Vol. I & III. 1989. Singhal, O.P. Suraj Prakashan, Allahabad.
5. Element of Agricultural Engineering. 1990. Sahay, Jagdishwar. Agro. Book Agency, New Chitragupta Nagar, Patna.

AG309: Manures and Fertilizers 2(1+1)

Theory:

Soil organic matter, Composition, Decomposability, C: N ratio. Soil biology, Biomass, Soil organisms and their beneficial and harmful roles. Raw materials – Manures – Bulky and concentrated – FYM, Composts – Different methods, Mechanical compost plants, Vermicomosting, Green manures, Oil cakes, Sewage and sludge – Biogas plant slurry, Plant and animal refuges. Fertilizers – classifications, Chemistry of manufacturing and properties of major nitrogenous (ammonium sulphate, urea, calcium ammonium nitrate, ammonium nitrate, ammonium sulphate nitrate) phosphatic (single super phosphate, enriched super phosphate, diammonium phosphate, ammonium poly phosphate), potassic and complex fertilizers, their fate and reactions in the soil, Secondary and micronutrients fertilizers, amendments, Fertilizer Control Order, Fertilizer storage; Important Biofertilizers and their advantage.

Practical:

Determination of organic carbon and microbial biomass C, N and P. Total nitrogen and phosphorus in manures / composts – Ammoniacal and nitrate nitrogen – Water soluble P2O5, potassium, calcium, sulphur and zinc contents of fertilizers, Adulteration in fertilizer.

References:

1. Yawalkar, K.S. and Agarwal. J.P. (1992). Manure and fertilizers. Agriculture-Horticulture Publishing House, Nagpur.
2. Tisdale, S.L. and Nelson, W.L. (1990). Soil Fertility and fertilizers, McMillan Pub. Co. N.Y. pp.754.
3. Sanchalli, V.K. (1960). Chemistry and Technology of Fertilizers. Reinhebl publishing corporation, New York,USA.
4. Chopra, S.L. and Kanwar, J.S. (1991). Analytical Agriculture, Chemistry, Kalyani Publishers, New Delhi.
5. Tandon, H.L.S. (1989). Soil water and fertilizers analysis, Fertilizer Development and Consultant organization, New Delhi
6. FAI. (1999). Fertilizer (Control) Order, 1985 and the essential commodities Act, 1995. FAI, New Delhi, pp. 203.
7. Kanwar, J.S. (1976). Soil Fertility: theory and practice. (ed) ICAR, New Delhi pp.583
8. McVicker, M.H. (1952). Using commercial fertilizers, Interstate Danvilk, US.

FOURTH SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 401	Field Crops- II (*Rabi*)	CORE	2	2	30	70	50	150	3 (2+1)
AG 402	Water Management	CORE	1	2	30	70	50	150	2 (1+1)
AG 403	Soil survey, Land Use Planning and Remote Sensing	CORE	1	2	30	70	50	150	2(1+1)
AG 404	Insect Ecology and Integrated Pest Management including Beneficial Insects	CORE	2	2	30	70	50	150	3(2+1)
AG 405	Production Technology of Vegetables and Flowers	CORE	3	2	30	70	50	150	4(3+1)
AG 406	Agricultural Finance and Co-operation	CORE	1	2	30	70	50	150	2(1+1)
AG 407	Crop Physiology	CORE	2	2	30	70	50	150	3(2+1)
AG 408	Entrepreneurship Development and Communication Skills	CORE	1	2	30	70	50	150	2(1+1)
AG 409	NCC/NSS	GENERIC	-	2	-	-	50	50	1(0+1)
TOTAL			**13**	**18**	**240**	**560**	**450**	**1250**	**22**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

AG401: Field Crops- II (*Rabi*) 3(2+1)

Theory:

Origin, geographical distribution, importance, production in Rajasthan and India, soil and climatic requirements, varieties, cultural practices *viz.* seed and sowing , intercultural operations, fertilizer, water and weed management, plant protection measures; harvesting and yield of wheat, barley; chickpea,; rapeseed and mustard, potato, sugarcane and lucerne; Package of practices of tobacco, sunflower, safflower, linseed, sugarbeet, isabgol , lentil ,berseem ,oats, opium poppy, frenchbean, taramira and peas.

Practical:

Identification of **s**eeds of *rabi* crops ,Seed bed preparation and sowing of wheat and sugarcane ; Calculations on seed rate; Top dressing of nitrogen in wheat and study of fertilizer experiments on *rabi* crops ; Identification of weeds in wheat and other *rabi* crops; Application of herbicides and study of weed control experiments; Morphological characteristics of wheat, barley, oats, rapeseed and mustard ; Yield contributing characters of crops, Judging sugarcane maturity and quality tests.

References:-

1. Singh, Chhidda; Singh P. and Singh, R. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Singh, S.S. 1998, Crop Management: Under irrigated and rainfed conditions.
3. Singh, S.S. 1993, Principles and Practices of Agronomy, Kalyani Publishers, New Delhi.
4. Reddy,T.Y. and Reddi, G.H.S. 1993. Principles of Agronomy, Kalyani Publishers, New Delhi.
5. Maiti, S. Hedge,M.R. and Chhattopadhyay, S.B. 1988. Handbook of Annual Oilseed Crops. Oxford & IBH Publishing Co., New Delhi.
6. Jaiswami, L.H. and Baldeo, B. 1990. Advances in Puulse Production Technology, ICAR, New Delhi.
7. Thakur, C. 1979. Crop Production, Vol. I & II. Metropolitan Book Pvt. Ltd., New Delhi.
8. Ahlawat, I.P.S. , Sharma, O.P. & Saini., G.S. 1998 Scientific Crop Production in India. Aman Publishing House, Madhu Market, Budhana gate, Meerut.

9. Rathore, P.S. 1999-2000. Techniques and Management of Field Crop Production. Agrobios (India), Jodhpur.
10. Rathore, P.S. and Sharma, S.K. 2003. Scientific Pulse Production. Yash Publishing House, Bikaner.
11. Sharma, Kalicharan 1990 Bharat ki promokh faslea. G.B. Pant Agricultural & Technology University, Nanital.
12. Reddy, S.R. 2004. Agronomy of Field Crops. Kalyani Publishers, New Delhi.

AG402 : Water Management 2(1+1)

Theory:

Irrigation: definition and objectives; Water resources and irrigation development in India and Rajasthan; Soil moisture constants and theories of soil water availability; Methods of soil moisture estimation; Evapotranspiration and crop water requirement; Scheduling of irrigation; Methods of irrigation: surface, sprinkler and drip irrigation; Irrigation efficiency and water use efficiency, Irrigation water quality and its management including conjunctive use of water; Water management of different crops (rice, wheat, maize, groundnut, sugarcane, pearlmillet, chickpea, mustard); Agricultural drainage

Practical:

Determination of bulk density by field method; Determination of soil moisture content by gravimetric, tensiometer, electrical resistance blocks and neutron moisture meter methods; Determination of field capacity by field method; Determination of permanent wilting point; Measurement of irrigation water using different devices; Calculations on irrigation water requirement and irrigation efficiencies (problems); Determination of infiltration rate; Demonstration of border method of irrigation ; Demonstration of furrow method of irrigation; Demonstration of check basin and basin method of irrigation; Acquaintance and upkeep of sprinkler and drip irrigation systems; Determination of EC, pH, carbonates biocarbonates and Ca+ Mg in irrigation water (quality parameters).

References:

1. Reddy,S.R. 2000. Principles of Crop Production , Kalyani Publishers, New-Delhi.
2. Majumdar, D.K. 2004. Irrigation Water Management- Principles and Practice.Prentice Hall of India , New-Delhi.
3. Mishra, R.D. and Ahmed, M. 1987. Manual on Irrigation Agronomy, Oxford & IBH Publishing Co.Pvt..Ltd., New-Delhi.

AG403: Soil Survey, Land Use Planning and Remote Sensing **2(1+1)**

Theory:

Soil profile development, soil survey: Significance and purpose of soil survey, methods of soil survey and mapping. Types of soil surveys: Detailed, Reconnaissance, and Detailed—reconnaissance soil survey. Land use planning: Land capability classification, Soil mapping units. Soil survey interpretations and soil survey report. Major soil groups of India with special reference to Rajasthan. Soil taxonomy – a comprehensive US system of soil classification. Remote sensing: concept of remote sensing. Aerial photography, Aerial and satellite sensor imaginary, image processing and interpretations.

Practical :

Examinations and description of typical soil profile. Interpretation of topographic map and delineation of physiographic boundaries based on important characters, typifying pedon excavation, examination and classification, interpretation of the identified soil characteristics and their evaluation for land use planning. Preparation of the soil survey report, interpretation of remote sensing information.

References:

1. Buol, S.W., Hole, H.D.and Mc Crackoh, R.J. (1980) Soil genesis and classification, Oxford and IBH publishing Co. New Delhi.
2. Cursau Paul, J. (1985) Principal of remote sensing, Loymen, New York.
3. Lilles, T.m. and Kiefer, R.W. (1979) Remote sensing and image interpretation John willey and sons, New York.
4. Patel, A.N. and Singh Surendra (1999) Principal of remote sensing, Scientific publishers (India) Jodhpur.
5. Sehgal, J. (2000) Pedology: Concepts and applications, Kalyani publisher, Ludhiana
6. ISSS (2002) Fundamental of Soil Science Div. of Soil Science, IARI, New Delhi

AG404: Insect Ecology and Integrated Pest Management Including Beneficia Insects

3 (2+1)

Theory:

Insect Ecology: Definition, scope and concept. Environment and its components. Agroecosystem. Effect of abiotic factors- temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – positive and negative interactions. Causes of pest outbreak. Pest surveillance and forecasting. Categories of pests. **IPM:** Introduction, importance, scope, concepts and limitations. Tools of IPM- Host plant resistance, cultural, mechanical and physical, legislative and biological control (parasites, predators and pathogens such as bacteria, fungi and viruses). Chemical control- Classification, toxicity and formulations of insecticides. Study of important insecticides- Botanicals, chlorinated hydrocarbons, organophosphates, carbamates, synthetic pyrethroids and novel insecticides, chitin synthesis inhibitors, rodenticides, acaricides and fumigants. Hormones and pheromones, repellents, antifeedants, attractants, gamma radiation and genetic control. Insecticides Act 1968- Important provisions. Application techniques of insecticides. Symptoms of insecticide poisoning, first aid and antidotes. **Beneficial insects:** Honeybee- Important species, rearing techniques, diseases and natural enemies. Silkworm- Important species, rearing techniques, diseases and natural enemies. Lac insect - rearing techniques, diseases and natural enemies.

Practical:

Visit to meteorological observatory and IPM laboratory. Pest surveillance through light traps, pheromone traps and field incidence. Study of sampling techniques for the estimation of insect population. Practicable IPM practices-Mechanical, physical and cultural methods Identification and application of parasites and predators. Botanical insecticides- Neem based products Chemical control- Insecticides and their formulations. Handling of plant protection equipments. Calibration of spray equipments. Calculation of doses/concentrations of insecticides. Calculation of doses/concentrations of insecticides. IPM case studies of one important field crop. Poison bait preparation for rodent control and its application. Safe handling of pesticides. Rearing technique for honeybees. Rearing technique for silkworm. Rearing technique for lac insect.

References:

1. Metcalf, R.L and Luckman W.H. 1982. Introduction to Insect Pest Management. Wiley Inter Science publishing, New York.
2. G.S.Dhaliwal and Ramesh Arora 2001. Integrated Pest Management. Concepts and Approaches. Kalyani publishers, New Delhi.
3. Larry P.Pedigo. 1991.Entomology and Pest Management. Mc Millan publishing company, New york.
4. Yazdani G.S. and Agarwal M.L. 1979. Elements of Insect Ecology. Naroji publishing house, New Delhi.
5. David, B.V. 2003. Elements of Economic Entomology, Popular Book Depot, Chennai.

AG405: Production Technology of Vegetables and Flowers 4(3+1)

Theory:

Importance and scope of Olericulture. Types of vegetable gardening. Classification of vegetables. Package of practices with reference to botanical name, family, origin, distribution, climate, soil, varieties, sowing, manure and fertilizers, irrigation, intercultural operations, harvesting, yield and plant protection measures including physiological disorders for fruit vegetables– tomato, brinjal, chilies, and okra; Cucurbitaceous vegetables-cucumber, ridge gourd, bottle gourd, bitter gourd, melons– water melon, musk melon and round melon, Cole crops– cabbage, cauliflower and knol-khol. Bulb crops– onion and garlic. Beans and peas– French bean, cluster bean, dolichos bean, peas and cowpea. Tuber crops– potato, sweet potato, colocasia,; Root crops– carrot, radish, turnip and beet root; Leafy vegetables– amaranths and palak. Introduction to protected cultivation of important vegetables viz. cucumber, capsicum and tomato. Importance and scope of floriculture. Principles of landscape gardening. Types and styles of ornamental gardening. Planting, care and management of lawn, ornamental trees, shrubs, climbers, palms, indoor- plants and seasonal flowers in the gardens. Package of practices for rose, jasmine, chrysanthemum, marigold and gladiolus. Introduction to protected cultivation of important flower crops viz. rose and gerbera.

Practical:

Planning and layout of kitchen garden; Identification of important vegetable and ornamental plants; trees (shrubs, climbers, house plants, palms etc.,) Raising of vegetable nurseries. Transplanting of vegetable seedlings in main field; Layout of lawns and maintenance; Potting, repotting and maintenance of house plants; Visit to commercial vegetable farms ;Training and pruning of rose (standards, hybrid ‘T’ roses scented roses) and chrysanthemum (pinching and disbudding); Planning and layout of gardens and garden designs for public and private areas; Harvesting indices of different vegetable crops; Grading and packing of vegetables; Prolonging the shelf life of cut flowers. Visit to different styles and types of gardens.

References:

1. Thompson, H. C. and Kelly, W.C. Vegetables Crops. Tata McGraw Hill
2. Chauhan, D.V.S. Vegetable Production in India. Ram Prasad & sons, Agra
3. Bose, T.K. Vegetables. Naya Prokash, Calcutta
4. Singh, S.P. Production Technology of Vegetables Crops. Agril. Res. Communication centre, Karnel
5. Choudhary, B.Vegetables. NBT, New Delhi
6. Gopalaswamiengar, K.S. The Complete Gardening in India.The Hosali Press, Bangalore
7. Arora, J.S. Introductory Ornamental Horticulture. Kalyani Publisher, Ludhiana

AG406: Agricultural Finance and Co-Operation 2 (1+1)

Theory:

Agricultural finance: nature and scope. Time value of money, Compounding and Discounting. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4R's 5C's and 7 P's of credit, repayment plans. History of financing agriculture in India. Commercial banks, nationalization of commercial banks. Lead bank scheme, regional rural banks, scale of finance. Higher financing agencies, RBI, NABARD, AFC, Asian Development Bank, World Bank, Insurance and Credit Guarantee Corporation of India. Assessment of crop losses, determination of compensation. Crop insurance, advantages and limitations in application, estimation of crop yields. Agricultural cooperation: philosophy and principles. History of Indian cooperative Movement, pre-independence and post independence periods, cooperation in different plan periods, cooperative credit structure: PACS, FSCS. Reorganisation of cooperative credit structure in Andhra Pradesh and single window system. Successful cooperative systems in Gujarat, Maharastra. Punjab etc.

Practical:

Factors governing use of Capital and identification of credit needs; Time value of money, Compounding and discounting; Tools of financial management, Balance sheet, Income statement and cash flow analysis, Estimations of credit needs and determining unit costs; Preparations and analysis of loan proposals; Types of repayment loans; Study of financial institutions: PACS, DCCB, Apex Banks, RRBs, CBs, NABARD.

References :-

1. Reddy, S. and Raghu Ram, P. "Agricultural Finance and Management" Oxford and IBH, New Delhi.
2. Singh, J.P. 1990. "Agricultural Finance – Theory and Practice" Ashish Publishing House, New Delhi
3. Pandey, U.K. "An Introduction to Agricultural Finance" Kalyani Publishes, New Delhi
4. Pandey, Mukesh and Tewari, Deepali "Rural and Agriculture Marketing"
5. Mamoria, C.B. "Agricultural Problems of India"
6. Krishnaswami, O.R. "Fundamental of Cooperation"

AG407: Crop Physiology 3 (2+1)

Theory:

Introduction – Definition of Crop Physiology – Importance in Agriculture and Horticulture. Crop Water Relations – Physiological importance of water to plants – Water potential and its components, measurement of water status in plants. Crop water relations (contd.) Transpiration – Definition – significance – Transpiration in relation to Crop productivity – Water Use Efficiency – WUE in C3, C4 and CAM plants – Factors affecting WUE. Photosynthesis – Energy synthesis – Significance of C3, C4 and CAM pathway – Relationship of Photosynthesis and crop productivity – Translocation of assimilates – Phloem loading, apoplastic and symplastic transport of assimilates – Source and sink concept – Factors affecting Photosynthesis for productivity – Methods of measuring photosynthesis – Photosynthetic efficiency – Dry matter partitioning – Harvesting index of crops. Photorespiration and crop productivity. Respiration and its significance – Importance of glycolysis, TCA cycle. Pentose Phosphate Pathway – Growth respiration and maintenance respiration, Alternate respiration– Salt respiration–wound respiration – measurement of respiration. Nutriophysiology– Definition – Mengel's classification of plant nutrients – Physiology of nutrient uptake– Functions of Plant nutrients – Deficience and todicity symptoms of plant nutrients – Foliar nutrition – Hydroponics – solution and sand culture. Physiology of flowering – Photoperiodism and Vernalisation in relation to crop productivity – Classification of plants – Commercial application of photoperiodism. Growth and Development – Definition – Types of growth – Determinate and Indeterminate growth – Monocarpic and Polycarpic species with examples, Measurement of growth – Growth analysis Growth characteristics – Definitions and mathematical formulae. Plant Growth Regulators – Occurrence – Biosynthesis – Mode of action of Auxins, Gibberellins, Cytokinins, ABA, Ethylene. Novel plant growth regulators – Commercial application of plant growth regulator in agriculture and horticulture. Senescence and abscission – Definition – Classification – Theories of mechanism and control of senescence – Physiological and biochemical changes and their significance. Abscission and its relationship with senescence. Seed Physiology – Seed dormancy – Definition – types of seed dormancy – Advantages and disadvantages of seed dormancy - Causes and remedial measures for breaking seed dormancy with examples – Optimum conditions of seed storage – Factors influencing seed storage (ISTA standards). Post Harvest Physiology - Fruit ripening – Metamorphic changes – Climacteric and non-climacteric fruits – Hormonal regulation of fruit ripening (with ethrel, CCC, Polaris, paclobuterozole) – Use of hormones in increasing vase life of flowers.

Practical:

Preparation of solutions. Growth analysis: Calculation of growth parameters. Methods of measuring water status in roots, stems and leaves. Estimation of water potential by Chardakov's method. Measurement of absorption spectrum of chloroplastic pigments and fluorescence. Measurement of leaf area by various methods. Stomatal frequency and index. Leaf anatomy of C3 and C4 plants (Demonstration by already prepared slides). Respirometer – measurement of respiration. Measurement of transpiration by different methods. Measurement of respiratory quotient (RQ). Optimum conditions for seed germination. Breaking seed dormancy (a.) Chemical method (b.) Mechanical method. Yield analysis. Seed viability and vigour tests. Effect of ethylene on regulation of stomata.

References:

1. N.K. Gupta & Sunita Gupta, 2004. Plant Physiology. Oxford & IBH Publication, New Delhi
2. R.L. Agarwal, 1995. Seed Technology, Oxford & IBH Publication, New Delhi
3. G.R. Noggle and G.J. Fritz, 1986. Plant Physiology, Prentic Hall of India Pvt. Ltd.
4. J.B. Salisbury and C.W. Ross (1992). Plant Physiology, Wadswar Publishing Company, Belmont, California
5. S.N. Pandey & B.K. Sinha (1995). Vikas Publishing House Pvt. Ltd., New Delhi

AG 408: Entrepreneurship Development and Communication Skills 2(1+1)

Theory :

Communication Skills: Meaning and Process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills. Public speaking. Entrepreneurship Development: Concept & Meaning. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalization and the emerging business / entrepreneurial environment. Entrepreneurial and managerial characteristics; managing an enterprise; motivational drives; entrepreneurial ethics; Entrepreneurship development Programmes- SWOT analysis, generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Government Policy on Small and Medium Enterprises (SMEs)/ SSIs. Export and Import Policies. Contract farming and joint ventures, public- private partnerships.

Practical :

Listening and note taking, writing skills, oral presentation skills; field diary and lad record; indexing, footnote and bibliographic procedures. Summarizing, abstracting; individual and group presentation. Practice on SWOT Analysis, visit to SMEs / SSIs.

References:

1. Akhouri, M.M.P., Mishra, S.P. and Sen Gupta, R. 1989. Trainers Manual on Developing Entrepreneurial Motivation, NIESBUD, New Delhi.
2. Bidgoli, H. 1989. Decision Support Systems: Principles and Practices, St. Paul, West Publishing Co., USA.
3. Goyal, D.P. 1994. Management Information System: Concept and Application, Deep & Deep Publisher, New Delhi.
4. Mancuso, J. 1974. The Entrepreneurs Handbook (Vol. 192(, Artech House, Inc., USA.
5. Patel, V.G. 1987. Entrepeneurship Development Programme in India and Its Relevance to Developing
   Countries, Entrepreneurship Development Institute of India, Ahmedabad.
6. Rao, T.,V. 1974. Development of an Entrepreneur, Indian Institute of Management, Ahmedabad.
7. Dipak De & M.S. Rao.Entrepreneurial behaviour of farmers : An axiomatic theory. ISBN 81-85694-36-2 , Ganga Kaveri Publishing House, D.35/77, Jangamawadimath,

Varanasi-221001 (India), Ph.-0542-2451936.

8. Dipak De & Basavaprabhu Jirli.Entrepreneurship : Theory and practice in agriculture. ISBN 81-85694- 57-5, Ganga Kaveri Publishing House, D.35/77, Jangamawadimath, Varanasi-221001(India)

FIFTH SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 501	Practical Crop Production - 1(*Kharif* crops)	CORE	0	2	-	-	50	50	1 (0+1)
AG 502	Rainfed Farming	CORE	1	2	30	70	50	150	2 (1+1)
AG 503	Principles of Plant Biotechnology	CORE	2	2	30	70	50	150	3(2+1)
AG 504	Crop and stored grain pests and their management	CORE	3	2	30	70	50	150	4(3+1)
AG 505	Breeding of Field and Horticultural Crops	CORE	2	2	30	70	50	150	3(2+1)
AG 506	Agricultural Marketing, trade and Prices	CORE	1	2	30	70	50	150	2(1+1)
AG 507	Protected cultivation and Post harvest Technology	CORE	1	2	30	70	50	150	2(1+1)
AG 508	Diseases of Field Crops and their management	CORE	2	2	30	70	50	150	3(2+1)
AG 509	Production technology of Spices, Aromatic and Medicinal crops	CORE	1	2	30	70	50	150	2(1+1)
TOTAL			**13**	**18**	**240**	**560**	**450**	**1250**	**22**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

AG501: Practical Crop Production -1(*Kharif* crops) 1(0+1)

Practical:

Crop planning, raising field crops in multiple cropping system, Field preparation, seed treatment, nursery raising, sowing, nutrient management, water management, weed management and management of insect pests and diseases of crops; Harvesting, threshing, drying, winnowing, storage and marketing of produce. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students.

References:

1. Yawalkar, K.S. Agarwal J.P. and Bokde S., 1992, Manures and Fertilizers. Agri-Horticultural Pub. House, Nagpur – India.
2. Balasubramaniyam, P. And Palaniappan, S.P. 2001. Principles and Practices of Agronomy, Agrobios (India), Jodhpur.
3. Reddy, S.R. 2002, Principles of Agronomy, Kalyani Publishers, New Delhi.
4. Singh, S.S. 1993, Principles and Practices of Agronomy, Kalyani Publishers, New Delhi

AG502: Rainfed Farming 2(1+1)

Theory:

History of rainfed agriculture and its importance in India with particular reference to Rajasthan, extent of problem and constraints related to climate, soil, technological and socio-economic conditions; Delineating criteria for rainfed and drylands; Efficient utilization of water through soil and crop management practices-reducing water losses through mulching (use of mulching), Use of antitranspirants- their kind and mode of action and effect on crop yield; Increasing water storage by reducing run off and increasing infiltration through mechanical and cultural measures; Water harvesting techniques; Watershed management- its concept, objectives and principles; Integrated watershed management for drylands; Efficient management of rainfed crops- land preparation, seeding and crop density, selection of crops and varieties for dryland, alternate cropping and land use strategies, soil fertility management and fertilizer use techniques, weed control and intercultural operations, mid season corrections for mitigating the aberrant weather.

Practical:

Delineating criteria for rainfed and drylands; Onset and withdrawal of the monsoon, amount, intensity and distribution in Rajasthan and India ; Critical analysis of rainfall and estimation of moisture index and aridity index, crops and cropping systems for drylands; Acquiring skill in tillage methods for *in situ* moisture conservation, effects of soil mulching and its effect on soil moisture. Spray of antitranspirants on dryland crops and their effects on crops; Seed soaking and seed treatment with chemicals for sowing under moisture stress conditions, methods of fertilizer application in dry land areas; Effect of plant density, thinning, leaf removal on crop growth under moisture stress condition; Study of the salient features of a model water shed; Alternate land use strategies-- Agro-forestry, grass legume forage and alley cropping systems; Visit to dry land experiments ; to expose students to the latest agro-techniques and watershed management practices; Study of run off plots and soil /nutrient losses.

References:

1. Singh, R.P. 1995, Sustainable Development of Dryland Agriculture in India. Scientific Publishers,
   Jodhpur.
2. Singh, S.S., 1993, Crop Management Under Irrigated and Rainfed Conditions, Kalyani Publishers, New Delhi.
3. De, G.C. 1989, Fundamentals of Agronomy Oxford and IBH Publishing Co., New Delhi.
4. Reddy, T.Y. and Reddi, G.H.S. 1992, Principles of Agronomy, Kalyani Publishers, New Delhi.
5. Dhruva Narayan, V.V.; Singh, R.P., Bhardwaj, S.P. Sharma, M. Sikka A.K., Vithal, K.P.R. and Das; S.K. 1947. Watershed Management for Drought Mitigation, ICAR Publication.
6. Murthy, J.V.S. 1994, Watershed Management Wiley, Eastern Limited, New Age International Limited, New Delhi.

AG503: Principles of Plant Biotechnology 3(2+1)

Theory:

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering: Scope and importance in crop Improvement : Totipotency and Morphogenesis, Nutritional requirements of in vitro cultures; Techniques of in vitro cultures, Micropropagation, anther culture, pollen culture, ovule culture, embryo culture, Test tube fertilization, Endosperm culture, factors effecting above in vitro cultures, Applications and achievements, somaclonal variation, Types, Reasons, somatic embryogenesis and synthetic seed production technology, Protoplast isolation, culture, manipulation and fusion, Products of somatic hybrids and cybrids, Applications in crop improvements, Genetic Engineering, Restriction enzymes, Vectors for gene transfer-, gene cloning, Direct and Indirect method of gene transfer-Transgenic plants and their applications. Introductory knowledge about blotting techniques, molecular markers, QTL, Marker assisted selection and application in crop improvement.

Practical:

Requirements of Plant tissue culture laboratory: Techniques in Plant tissue culture- Media Components and preparation; sterilization techniques and inoculation of various explants, callus induction and plant regeneration; Demonstration of Micropropagation, Anther culture, embryo culture, Hardening/ Acclimatization of regenerated plants, somatic embryogenesis and synthetic seed production, Demonstration of isolation and culture of protoplast, demonstration of isolation of DNA, gene transfer technique and gel electrophoresis techniques.

References:

1. Brown, T.A.2001 gene cloning and DNA Analysis-An Introduction, Blackwell Science, London
2. Gupta, P.K.2006. Biotechnology and Genomics, Rastogi Publication, Meerut
3. Prohit, S.S.1997, Biotechnology, Agrobotanical Publication Bikaner
4. Rajdan, M.K.1996, An introduction to, plant tissue culture, Oxford and IBH Publishing Company, New Delhi
5. Ramawat, K.G. 2000, Plant Biotechnology, Kalyani Publishers, Ludhiana
6. Mascarenhas, A.F. 1991. Handbook of Plant Tissue Culture, Publications and Information Division, ICAR, New Delhi.

AG504: Crop and Stored Grain Pests and Their Management **4 (3+1)**

Theory:

Polyphagous pests: Red hairy caterpillar, White grub, Termite, Locust, Grasshopper.**Crop pests:** Distribution, biology, nature and symptoms of damage, and management of insect pests of rice, pearlmillet, sorghum, maize, wheat, sugarcane, cotton, pulses (Gram and *Kharif* pulses), groundnut, castor, sesame, sunflower, mustard, soybean, brinjal, okra, tomato, cruciferous and cucurbitaceous vegetables, potato, chillies, onion, garlic, mango, citrus, pomegranate, guava, ber, apple, coconut and ornamental plants. **Stored grain pests:** Coleopteran and Lepidopteran pests, their identification, biology and damage. Preventive and curative methods for control of stored grain pests.

Practical:

Identification, damage symptoms and management of insect pests of rice, pearlmillet, sorghum, maize, wheat, sugarcane, cotton, pulses, castor, mustard, brinjal, tomato, okra, cruciferous and cucurbitaceous vegetables, onion, garlic, chillies, mango, guava, citrus, pomegranate, ber, coconut. Identification, biology, damage symptoms and management of stored grain and polyphagous insect pests.

References:

1. Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.
2. David B.V. 2003. Elements of Economic Entomology, Popular Book Depot, Chennai
3. Pradhan, S. 1968. Insect Pests of Crops, National Book Trust, New Delhi
4. Nayar, M.R.G.K. 1986. Insects and Mites of Crops in India, ICAR, New Delhi.
5. Srivastava, K.P. 2004. A Text Book of Entomology, Vol.II, Kalyani Publishers, Delhi

AG505: Breeding of Field and Horticultural Crops 3 (2+1)

Theory:

Botany and taxonomy, chromosome number, center of origin, species relationship, floral biology, breeding objectives and constraints, disease and pest resistance and quality (physical, chemical, nutritional and marketing) improvement, conventional and non-conventional breeding methods, important varieties and future thrust area in crops like wheat, rice, maize, pearlmillet, gram, moth, groundnut, mustard, cotton, potato, tomato, rose, chillies, cauli flower, coriander, fenugreek, and amla.

Practical:

Study of floral biology, hybridization technique, germplasm and segregating populations. Layout of breeding experiments. Observation recording, analysis and interpretation of breeding trials. Calculation of variability parameters, heterosis and inbreeding depression. Salient features of varieties recommended for the region for the crops as listed in theory portion.viz., rice, wheat, maize, sorghum, groundnut, cotton, potato, tomato, sugarcane, rose, marigold, mango and papaya (available at the time of semester).

References:

1. Chopra, V.L. 2000 Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Chaddha. K.L. and Rajendra Gupta. 1995. Advances in Horticulture Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.
3. Mandal, AK., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding Vol. I and II. CBS Publishers and Distributors, New Delhi.
4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenti-First Century (Edt). International Book Distributing Co. Lucknow
5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co.. INC, East Port, Conneacticut, USA.
6. Ram, H.H. and H.G. Singh. 1994. Crop Breeding and Genetics. Kalyani Publishers, New Delhi.
7. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.
8. Ram. H.H. 2005. Vegetable Breeding — Principles and Practices. Kalyani Publishers, New Delhi.

AG506: Agricultural Marketing, Trade and Prices 2 (1+1)

Theory:

Agricultural Marketing: Concepts and Definition, Scope and subject matter, Market and Marketing: Meaning, Definitions, Components of a market, Classification. Market structure, Conduct, performance. Marketing structure, Market functionaries or agencies, Producer's surplus: Meaning, Types of producers surplus, marketable surplus. Marketed surplus, importance, Factors affecting Marketable surplus. Marketing channels: Meaning, Definition, Channels for different products. Market integration, Meaning, Definition, Types of Market Integration. Marketing efficiency: Meaning, Definition, Marketing costs, Margins and price spread, Factors affecting the cost of marketing, Reasons for higher marketing costs of farm commodities, Ways of reducing marketing costs. Theories of International Trade: Domestic Trade, Free trade, International Trade, GATT, WTO, Implications of AOA. Market access, Domestic support, Export subsidies, EXIM-Policy & Ministerial conferences. Cooperative Marketing. State Trading. Ware Housing Corporation; Central and State, Objectives, Functions, Advantages. Food Corporation of India: Objectives and Functions. Quality Control, Agricultural Products, AGMARK. Price Characteristics of agricultural product process, Meaning, Need for Agricultural Price Policy. Risk in Marketing: Meaning and importance, Types of Risk in Marketing. Speculations and Hedging, Futures trading, Contract farming.

Practical:

Identification of marketing channels; Study of Rythu Bazars, Regulated markets; Study of unregulated markets; Study of livestock markets; Price spread analysis; Visit to market institutions, NAFED; Study of SWC, CWC and STC; Analysis of information of daily prices; Marketed and marketable surplus of different commodities.

References

1. S.S. Acharya and N.L. Agarwal (1987) Agricultural Marketing in India, Oxfgord &IBH, New Delhi

2. J.R. Moore, S.S. Johl and A.M. Khusro (1973) Indian Food Grain Marketing, Printice Hall, New Delhi
3. A.S. Kahlon & D.S. Tyagi (1983) Agricultural Price Policy in India, Allied Publishers, New Delhi
4. V.K. Bhall and S. Shiva Ramu (1996) International Business-Environment and Management, Anmol Publications (P) Limited, New Delhi

AG507: Protected Cultivation and Post Harvest Technology 2(1+1)

Theory:

Green house technology- Introduction, types of green houses; Green houses equipments; Material of construction for traditional and low cost green houses; Irrigation systems used in green houses; Introduction: Scope and development of post harvest engineering; Basic engineering properties of cereals; Parts, care and maintenance of threshers and winnowers; Basic concepts and equipments used for cleaning and grading; Conveying equipment; Grain drying- need, methods, factors affecting drying and the different types of dryers; Silos; Grain storage structures and requirements of good storage structure.

Practical:

Determination of basic engineering properties and moisture content of grains; Study of thresher and winnower; Screen cleaners; Air- screen and other cleaners; Conveying equipments; Mechanical dryers; Silos and grain storage structures.

Reference:-

1. Post Harvest Technology of Cereals, Pulses and Oil Seeds.1999. Chakravarty, A. Oxford and IBH Pub. New Delhi.
2. Agricultural Process Engineering. 1955. Henderson, S.M. and R.L. Perry. John Willy and Sons, New York.
3. Principles of Agricultural Engineering, Vol. I. 1993. Michael, A.M. and T. P. Ojha . Jain Brothers, New Delhi.

AG508: Disease of Field Crops and Their Management 3(2+1)

Theory:

Economic importance , symptoms , etiology, disease cycle and management of diseases of **Wheat** (rusts, loose smut and Karnal bunt); **Barley** (covered smut and stripe disease); **Bengal gram** (Ascochyta blight and wilt); **Mustard** (white rust, Alternaria blight and white rot); **Rice** (blast, bacterial blight and khaira); **Maize** (brown stripe downy mildew , sugarcane downy mildew and Fusarium stalk rot); **Sorghum** (grain smut , loose smut and anthracnose); **Bajra** (ergot, smut and downy mildew); **Sugarcane** (red rot, whip srnut and grassy shoot disease); **Groundnut** (tikka and collar rot); **Cotton** (root rot ,bacterial blight and leaf curl); **Sesamum** (bacterial leaf blight and phyllody); **Pigeonpea** (wilt and sterility mosaic);**Clusterbean** (Alternaria blight); **Castor** (Fusarium wilt and bacterial blight); **Soybean** (bacterial pustule and charcoal rot); **Moth** and **Mungbean** (yellow mosaic virus).

Practical:

Study of symptoms, etiology, host-parasite relationship and control measures of diseases of wheat, barley, bengal gram, rice, maize, sorghum, bajra, sugarcane, groundnut, cotton, clusterbean, moth and mungbean. Visits of diseased field during the semester. Student should submit at least 25 pressed well mounted disease specimens.

Reference:-

1 Cook A A 1981 . Diseases of tropical and sub-tropical field fiber and oil plants. Mac Millan Publishing Co. New York.

2 Gupta V K and Paul Y S (eds) 2002. Diseases of field crops. Indus Publishing Co. ND.

3 Mehrotra R S and Aggarwal A.2007.Plant Pathology (2^{nd}.ed.) Tata McGraw-Hill Publishing Co Ltd. ND.

4 Mishra A ,Bohra A and Mishra A 2005. Plant Pathology. Agrobios. Jodhpur (India).

5 Rangaswamy ,G and Mahadevan,A .2001. Diseases of crop plants in India. Prentice hall of India Pvt Ltd

6 Singh R S .2007 Plant Diseases.(8^{th}.ed) Oxford and IBH Publishing Co.Pvt .Ltd .ND

AG509 : Production Technology of Spices, Aromatic and Medicinal Crops 2 (1+1)

Theory:

Importance and scope of Spices, Aromatic and Medicinal crops. Cultivation technology of Spices, Aromatic and Medicinal crops– ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek, fennel; Aromatic crops – lemon grass, citronella, palmarose, vetiver; Medicinal plants –opium, ocimum, aloe, guggal, senna, plantago, stevia, curry leaf, drumstick.

Practical:

Identification of spices, aromatic and medicinal plants, Propagation techniques of spices, aromatic and medicinal crops. Propagation and planting methods of turmeric; Harvesting procedures in aromatic plants; Processing and curing of spices (ginger, turmeric and black pepper); Cost of cultivation of spices. Visit to aromatic & medicinal plant nurseries and seed spices field.

References:

1. Sharma, R. (2004). Agrotechniques of Medicinal Plants. Daya Publishing House, Delhi
2. Pruthi, J.S. (1993). Major Spices of India.Crop Management & Post harvest Technology. ICAR, New Delhi
3. Dashora, L.K. Production Technology of Plantation Crops, Spices, Aromatic & Medicinal Plants.

SIXTH SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
AG 601	Practical Crop Production –II *(Rabi)*	CORE	0	2	-	-	50	50	1 (0+1)
AG 602	Farming Systems, Sustainable Agriculture and Organic Farming	CORE	2	2	30	70	50	150	3 (2+1)
AG 603	Principles of Seed Technology	CORE	2	2	30	70	50	150	3(2+1)
AG 604	Extension Methodologies for Transfer of Agricultural Technology	CORE	1	2	30	70	50	150	2(1+1)
AG 605	Livestock Production and Management	CORE	2	2	30	70	50	150	3(2+1)
AG 606	Environmental Science	AECC	2	2	30	70	50	150	3(2+1)
AG 607	Post harvest management and value addition of fruits and vegetables	CORE	2	2	30	70	50	150	3(2+1)
AG 608	Diseases of Horticultural Crops and their management	CORE	1	2	30	70	50	150	2(1+1)
AG 609	Fundamentals of Agri. Business Management	CORE	1	2	30	70	50	150	2(1+1)
TOTAL			**13**	**18**	**240**	**560**	**450**	**1250**	**22**
***Passing marks will be 40% for individual paper and 50% in a semester aggregate.**									

AG 601: Practical Crop Production –II *(Rabi)* 1(0+1)

Practical:

Crop planting, raising field crops in multiple cropping systems: Field preparation, seed treatment, nursery raising sowing, fertilizer application, water management, weed management, intercultural operation, management of insect, pest and diseases of crop; Harvesting, threshing, drying, winnowing, storage and marketing of produce; Preparation of balance sheet including cost of cultivation, net return per student as well as per team of a group of students.

References:

1. Yawalkar K.S., Agarwal, J.P. and Bokde, S. 1992. Manures and Fertilizers. Agri-Horticultural Pub. House, Nagpur- India.
2. Balasubramaniyan, P. and Pallaniappan, S.P. 2001. Principles and Practices of Agronomy, Agrobios (India) , Jodhpur.
3. Reddy ,S.R. 2002 . Principles of Agronomy. Kalyani Publishers, New-Delhi.
4. Singh, S.S. 1993. Principles and Practices of Agronomy, Kalyani Publishers, New-Delhi.

AG 602 : Farming Systems, Sustainable Agriculture and Organic Farming 3(2+1)

Theory:

Sustainable agriculture: definition, current concept ; Factors affecting ecological balance and ameliorative measures; Land degradation and conservation of natural resources; Low external input agriculture (LEIA) & high external input agricultural (HEIA); Irrigation problems; Waste lands and their development; Differences between conventional and sustainable agricultural systems; Organic farming: definition, principles , components and relevance in present context; Organic production requirements; Biological intensive nutrient management-organic manures, vermicomposting, green manuring, recycling of organic residues, biofertilizers; Soil amendments; Integrated diseases and pest management – use of biocontrol agents, biopesticides, pheromones, trap crops, bird perches; Organic produce: quality considerations, certification, and accreditation; Farming systems: definition, principles and components, Intergrated farming system (I F S) models for wetland, irrigated dryland and dryland situations.

Practical:

Preparation of cropping scheme for irrigated situations; Preparation of cropping scheme for dryland situations; Study of existing farming systems in nearby villages; Preparation of integrated farming system model for wetlands; Preparation of integrated farming system model for drylands; Preparation of enriched Farm Yard Manure; Preparation of Vermicompost; Study of profitable utilization of agricultural wastes; Visit to poultry and dairy units to study resource allocation, utilization and economics; Visit to an organic farm to study various components and utilization; Manurial requirement through vermicompost, FYM and poultry manure based on major nutrients; Estimation of organic carbon in organic manures; Technique for treating legume seed with *Rhizobium* and use of *Azotobactor* , *Azospirillum* and PSB in field crops ; Sustainable yield index and sustainable value index ; Productivity index of some important cropping sequences ; Raising of crops organically.

References:

1. Panda, S.C. 2004. Cropping Systems and Farming Systems, Agrobios (India), Jodhpur.
2. Sharma, Arun K. 2002. A Handbook of Organic Farming, Agrobios (India) Ltd., Jodhpur.

3. Balasubramaniyan, P. and Palaniappan, S.P. 2004. Principles and Practices of Agronomy, Agrobios
(India) ,Jodhpur.
4. Shukla, Rajeev K. 2004. Sustainable Agriculture, Surbhee Publications, Jaipur.
5. Palaniappan, SP. 1985. Cropping Systgems in the Tro;ics : Principles and Management, Wiley Easter
Ltd. And TNAU, Ciombatore.
6. Reddy, S.R. 2004. Principles of Agronomy, Kalyani Publishers, Ludhiana.
7. Palaniappan, S.P. and Sivraman, K. 1996. Cropping system in Tropics, International Pvt. New-Delhi.
8. Dahama, A.K. 1999. Organic Farming, Agro Botanic, Bikaner.
9. Sharma, Arun K. 2002. A Handbook of Organic Farming , Agrobios (India) , Jodhpur.
10. Palaniappan, S.P. and Anandurai, K. 1999. Organic Farming- Theory and Practice, Scientific Pub. Jodhpur.
11. Thapa, U and Tripathy, P. 2006. Organic farming In India: Problems and Prospects, Agrotech,
Publishning Academy, Udaipur.
12. Gautam , R.C. and Singh, Punjab 1997. Tikau Kheti , Bhartia Krishi Anusandhan Parishad, New-Delhi.
13. Sharma, Arun , K. 2005 . Gevik Kheti- Sindant, Taknik and Upyogita. Agrobios, Jodhpur.

AG 603: Principles of Seed Technology 3(2+1)

Theory:

Importance of improved seed in agriculture. Seed technology-definition, objective, relationship with other sciences. Seed quality-definition, characters of good quality seed and classes of seed. Seed policy, seed demand forecasting and planning of certified, foundation and breeder seed production. Determination of crop seed varieties, factors affecting deterioration and their control; Maintenance of genetic purity during seed production. Steps involved in development of seed progeramme and seed multiplication. Production of nucleus of & breeder seed, Maintenance and multiplication of pre-release and newly released varieties in self and cross pollinated crops. Seed production- foundation and certified seed production of maize,bajra,sorghum (hybrids,synthetics and composites), rice,cotton,tomoto and hybrids:chillies and cucurbits(varieties and hybrids) : seed production of wheat,barley, gram and rape seed mustard. Seed certification phases of certification, procedure for seed certification and field inspection, fields counts. Seed act 1966 and Seed act enforcement, Central seed committee, Central Seed Certification Board, State Seed Certification Agency.Central and State Seed Testing Laboratories;Duties and powers of seed inspectors,offences and penalities. Seed control order:Seed control order 1983.Intellectual Properties Rights, Patenting,WTO,Plant Breeders Rights and Farmer,s Right.Seed drying-Forced air seed drying,principle,properties of air and their effect on seed drying,moisture equilibrium between seed and air.Seed processing-planning and establishment of seed processing plant;air screen machine and its workingprinciple, different upgrading equipment and their use.Principles of seed treatment , Seed storage; stages of seed storage, factors affecting seed longevity storage and conditions required for good storage, general principles of seed storage. Seed marketing- marketing structure, marketing organization.

Practical:

Seed sampling principles and procedures.Physical purity analysis of field and horticultural crops; Moisture testing; Germination analysis and viability test of field and horticultural crops; Vigour test of field and horticultural crops; KOH and NaOH test for varietal identification; Visit of GOT field at University farms; Varietal identification in seed production plots;Planting ratio,Minimum seed certification standards of important crops in the vicinity.

References:

1. Agarwal, R.L.1991.Seed Technology, Oxford & IBH Publishing Co. Delhi
2. Agarwal, P.K. 1999. Seed Technology, ICAR, New Delhi.
3. Maloo,S.R., Intodia, S.K. and Pratap Singh.2008. Beej Pradyogiki.Agrotech Publishing Academy.
4. A.K. Joshi and B.D. Singh.2005.Seed Technology. Kalyani Publishers, New Delhi.

AG 604: Extension Methodologies for Transfer of Agricultural Technology 2(1+1)

Theory :

Communication - Meaning, Definition, Models, Elements and their Characteristics, Barriers in Communication. Extension Programme Planning - Meaning, Definition of Planning, Programme, Project, Principles and Steps in Programme Planning Evaluation - Meaning, concept and types. Extension Teaching methods - Meaning, Definition and Classification. Individual contact methods – Farm and Home visit, Telephone call, E-mail. Group contact methods – Group discussion, Method and Result demonstrations; Small group discussion techniques – Lecture, Panel, Workshop, Syndicate group, Brain Storming, Seminar, Conference and Buzz group. Mass contact Methods- Campaign, Exhibition, Kisan Mela, Radio & Television -Meaning, Importance, steps, Merits & Demerits. Factors influencing in selection of Extension Teaching methods. Innovative Information sources – Internet, Cyber Cafes, Video and Tele conferences, Kisan call centers. Diffusion-Meaning, Definition and Elements. Adoption Process- Meaning, Stages, Innovation decision process, Adopter categories and their characteristics, Factors influencing adoption process.

Practical:

Organization of Group discussion and Method demonstration. Planning and Writing of scripts for Radio and Television. Preparation of selected audio-visual aids- Charts, Posters, Over Head Projector(OHP) Transparencies, Power Point Slides. Leaflet, Folder, Pamphlet, News Stories and Success Stories. Handling of Public Address Equipment (PAE) System, Still Camera, Video Camera and Liquid Crystal Display (LCD) Projector.

References:

1. Das Gupta, S. 1989. Diffusion of agricultural Innovation in Indian Villages, Wiley Eastern Ltd., New Delhi.
2. Kumar, K.J. 2000. Mass Communication in India, Jaico Publishing House, 121 Mahatama Gandhi Road, Mumbai.
3. Mathur, K.B. 1994. Communication for Development & Social change, Allied Publisher Ltd., New Delhi.
4. Rogers, E.M. and Shoemaker, F.F. 1971. Communication of Innovations – A Cross cultural Approach, The Free Press, New York.
5. Sandhu, A.S.1993. Text book on Agricultural Communication : Process & Method, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
6. Reddy, A.A. 1993. Extension Education, Shri Laxmi Press, Baptala.

AG 605: Livestock Production and Management 3 (2+1)

Theory:

Place of livestock in the national economy. Different livestock development programs of Government of India. Important exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Measures and factor affecting fertility in livestock. Reproductive behaviors like puberty, estrus, pregnancy and parturition. Milk secretion, milking of animal and factor affecting milk yield and composition. Selection and breeding of livestock for higher milk and meat production. Feeding and management of calves, growing heifers and milch animals. Housing principles, space requirements for different species of livestock. Disease control measures, sanitation and care. Breeding, feeding and production records. Breed characteristics of poultry. Systems of housing, feeding and management. Incubation, hatching and brooding. Vaccination and prevention of diseases, Preservation and marketing of eggs, its economics and keeping quality. Cost of production of milk.

Practical:

Identification, handling and restraining of farm animals. Judging and culling of dairy cattle and poultry. Feeding and ration formulation for categories of livestock. Housing and management of poultry. Visit to livestock farms. Economics of livestock production.

Reference

1. Banerjee, G. C. 2011. A Text Book of Animal HusbandryVIII ed. Oxford and IBH Publications. New Delhi.
2. ICAR. 2011. Hand Book of Animal Husbandry published by DIPA, ICAR, New Delhi.
3. Ranjan, SK.1994 AnimalNutrition and Feeding Practices. Vikash Publications. New Delhi.
4. Sukumar,De. 2000. Outlines of dairy technology. Oxford University Press,New Delhi.
5. Thomus C.K., Sastry NSR and Singh,RA.1982.Farm Animal Management and Poultry Production.Vikash Publications. New Delhi.

AG 606: Environmental Science 3(2+1)

Theory:

Scope and importance of environmental studies and biological chemistry. Renewable resources : Forest, Water, Food, energy and land - various environmental cycles viz. carbon, nitrogen and water etc. Energy flow in the ecosystem : concept of photosynthesis and respiration. Woman and child welfare – food, balance diet, vitamins and minerals etc. HIV/AIDS – viruses and nucleic acids, modification and propagation. Role of information technology on environment and human health – nutrition/malnutrition in communities. Concept of biological processing of industrial wastes. *

Ecology : Definition and scope. Ecosystems: Definition, types, concept, structure, functions, components and food pyramids. Producers, consumers and decomposers of an ecosystem. Bio-diversity: Definition, classification, threats to biodiversity and its conservation. The Environment Protection Act, The Air Act, The water Act, The Wildlife Protection Act and Forest Conservation Act.**

Environmental pollution: Causes, effects and control of air, water, soil, thermal, noise and marine pollution. Causes, effects and management of soil nuclear hazards and industrial wastes.***

Practical:

Estimation of chlorophyll content of fresh water/sea water ecosystem. Study of transpiration and water balance in plants. Estimation of ascorbic acid (Vitamin C). Community survey for nutritional health status. Estimation of proline as stress indicator in plants. *

Estimation of pesticide contamination in Agro-Ecosystem. Determination of sound level by using sound level meter. Estimation of respirable and non respirable dust in the air by using portable dust sampler. Estimation of species abundance of plants. Visit to ecosystems and study of biodiversity. **

Collection, processing and storage of effluent samples; Determination of Bio-Chemical oxygen demand (BOD) in effluent sample; Determination of chemical oxygen demand (COD) in effluent sample; Estimation of dissolved oxygen in effluent samples; Determination of total dissolved solids (TDS) in effluent samples; Estimation of nitrate contamination in ground water. Analysis of temporary and total hardness of water sample by titration. Determination of heavy metals in sewage and sludge. ***

References:

1. Bamanayha B.R., Verma, L.N. and Verma A (2005). Fundamentals of Environmental Sciences, Yash Publishing House, Bikaner
2. Dhaliwal G.S., Sangha G.S. and Ralhan P.K. (2000) Fundamentals of Environmental Sciences,Kalyani Publishers, New Delhi
3. Odum E.P. and Barrett G.W.(2007) Fundamentals of Ecology, Brooks/Cole, Akash Press, New Delhi
4. Agrawal, K.C.(1999) Environmental Biology, Agro Botanica, Bikaner
5. Kumar, H.D.(1997) Modern concepts of Ecology, Vikash Publishing House Pvt. Ltd. New Delhi
6. Dhaliwal G.S., and D.S.Kley (2006) Principles of Agricultural Ecology. Himalyan Publishing house, Bombay
7. Brij Gopal, and N.Bhardwaj (2004) Elements of Ecology. Vikash Publishing House, Pvt. Ltd., New Delhi.
8. Fawler, F.B.(1961). Radioactive Fall out, Soils, Plants, Food, Man (Ed.) Elsevier Science, Netherland
9. Kudesta, V.P.(1990). Pollution Everywhere, Pragatgi Prakashan, Meerut
10. Nemeron, R.L.1976. Industrial Water Pollution. Addison Wesley
11. Page, R.A.I., Miller, H. and Keeney, D.R., (1992) Methods of Soil Analysis Part-2 (Ed.) American Soc. Agronomy Madison, Wisconch, USA
12. Mishra, P.C.(2001). Soil pollution and Soil Organism, Ashish Publishing House, 8/81, Punjab Bagh, New Delhi – 110026.
13. Pathak, H.and Kumar, S.,(2003). Soil and Green House Effect, CBS Publishers and Distributors, 4596/1-A, 11, Dayaganj, New Delhi – 10002.

AG607: Post Harvest Management and Value Addition of Fruits and Vegetables 3(2+1)

Theory:

Importance of post harvest technology in horticultural crops. Maturity indices, harvesting and post-harvest handling of fruits and vegetables. Classification of fruit crops on the basis of ripening and ripening process. Factors affecting ripening of fruits and vegetables. Pre- harvest factors affecting quality on post-harvest shelf-life of fruits and vegetables. Factors responsible for detioration of harvested fruits and vegetables. Chemicals used for hastening and delaying ripening of fruits and vegetables. Primary processing of fruits and vegetables. Methods of storage – pre-cooling, pre-storage treatments, low temperature storage, controlled atmospheric storage, hypobaric storage, irradiation and low cost storage structures. Various methods of packing, packaging materials and transport. Importance and scope of fruit and vegetable preservation in India. Principles of preservation by heat, low temperature, chemicals and fermentation. Unit layout– selection of site and precautions for hygienic conditions of the unit. Preservation through canning, bottling, freezing, dehydration, drying, ultraviolet and ionizing radiations. Preparation of jams, jellies, marmalades, candies, crystallized and glazed fruits, preserves, chutneys, pickles, ketchup, sauce, puree, syrups, juices, squashes and cordials Spoilage of canned products, biochemical, enzymatic and microbial spoilage. Laws prohibiting processed fruit and vegetables food adulteration in India

Practical:

Practice in judging the maturity of various fruits and vegetables. Construction of zero energy cool chambers for on farm storage. Determination of physiological loss in weight (PLW), total soluble solids (TSS), total sugars, acidity and ascorbic acid content in fruits and vegetables. Effect of ethylene on ripening of banana, sapota and mango. Identification of equipment and machinery used in preservation of fruits and vegetables. Preservation by drying and dehydration. Preparation of jam, jelly and marmalades. Preparation of squash, cordials and syrups. Preparation of chutneys, pickles, sauces and ketchup. Visit to processing units, market yards, cold storage units and packing industries.

References:

1. Srivastava, R.P. and Kumar, S. (2007). Fruits and Vegetable Preservation. Principle and Practices. International Book Distributing Comp., Lucknow
2. Lal, G., Siddapa, G.S. and Tandon, G.L. (1967). Fruit and vegetable Preservation in India. ICAR, New Delhi
3. Nair, S.S. And Sharma, H.C. (2006). Phal Tarkari Parikshan Praydhogiki.Rajasthan Hindhi Granth Academy, Jaipur

AG 608: Diseases of Horticultural Crops and Their Management 2(1+1)

Theory:

Economic importance, symptoms, etiology, disease cycle and management of diseases of **citrus** (canker,dieback); **mango** (malformation and black tip); **banana** (panama wilt and sigatoka); **grapevine** (downy mildew and anthracnose); **pomegranate** (bacterial blight); **papaya** (foot rot and ring spot); **guava** (wilt and Zn deficiency); **apple** (scab); **ber** (powdery mildew): **potato** (late blight and black heart); **tomoto** (early blight and leaf curl); **chilli** (anthracnose); **brinjal** (Phomopsis blight and little leaf disease); **bhindi** (yellow vein mosaic); **pea** (powdery mildew); **cabbage** (black rot); **cucurbits** (downy mildew); **onion** (purple blotch); **ginger** (rhizome rot) and **rose** (powdery mildew).

Practical:

Study of symptoms, etiology, host-parasite relationship and control measures of diseases of citrus, mango, grapevine, pomegranate, papaya, guava, ber, potato, tomoto, chilli, brinjal, bhindi, pea, onion. Field visits at orchards and vegetable fields during the semester.

References:-

1 Gupta, S.K. and Thind, T.S. 2006. Disease problems in vegetable production. Scientific Publishers,Jodhpur.

2 Mehrotra, R.S. and Aggarwal, A. 2007.Plant Pathology (2^{nd}.ed.) Tata McGraw-Hill Publishing Co Ltd., New Delhi.

3 Rangaswamy, G. and Mahadevan, A .2001 Diseases of crop plants in India. Prentice Hall of India Pvt Ltd., New Delhi.

4 Singh, R.S. 2006. Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

5 Singh, R.S.1994 Diseases of vegetable crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

6 Singh, R.S. 2007. Plant Diseases. (8^{th}.ed) Oxford and IBH Publishing Co. Pvt . Ltd. New Delhi.

AG 609: Fundamentals of Farm Business Management (including Project Development, Appraisal and Monitoring) 2 (1+1)

Theory :-

Agribusiness: Meaning. Definition, Structure of Agribusiness, (Input. Farm. Product Sectors). Importance of Agribusiness in the Indian Economy, Agricultural Policy. Agribusiness Management. Distinctive features, Importance of Good Management. Definitions of Management. Management Functions, Planning. Meaning, Definition, Types of Plans (Purpose or Mission. Goals or Objectives. Strategies, Polices. Procedures, rules. programmes, Budget) characteristics of sound plan, Steps in planning, Organisation. Staffing, Directing. Motivation, Ordering, Leading. Supervision, Communication, control. Capital Management. Financial Management of Agribusiness: Importance of Financial Statements, Balance sheet, Profit and Loss Statement, Analysis of Financial statements. Agro-based Industries: Importance and Need, Classification of Industries, Types of Agro-based Industries. Institutional arrangement, Procedure to set up agro-based industries, Constraints in establishing agro-based industries. Marketing Management: Meaning, Definitions. Marketing Mix. 4Ps of Marketing. Mix, Market segmentation, Methods of Market. Product life cycle. Pricing policy, Meaning. pricing method. Prices at various stages of Marketing. Project, definitions, project cycle. Identification, Formulation. Appraisal, Implementation. Monitoring and evaluation, Appraisal and Evaluation techniques, NPW, BCR. IRR, N/C ratio, sensitivity analysis. characteristics of agricultural projects: preparation of project reports for various activities in agriculture and allied sectors: Dairying, poultry, fisheries. agro-industries etc.

Practical:

Study of input markets: seed. fertilizers, pesticides. Study of output markets. grains, fruits, vegetables, flowers. Study of product markets. retail trade commodity trading, value added products. Study of financing institutions cooperatives commercial banks, RRBs. Agribusiness Finance Limited, NABARD: Preparations of projects. Feasibility reports; Project appraisal techniques: Case study of agro-based industries.

References

1. Principles and practice of Marketing in India· C B Mamoria and Joshi
2. Agricultural finance and Management-S Subba Reddy and P Raghu Ram
3. Marketing Agricultural Products - Kohls and Uhl
4. Marketing Management - Kotler

SEVENTH SEMESTER

THEORY PAPERS			No. of Teaching Hours		Marks Allocation				
					Theory		Practical		
Code	Subject/Paper	Type	L	P	Internal	External		Total	Credits
GROUP A: CROP PRODUCTION AND ALLIED DISCIPLINES (any six papers are to be opted)									
AG A701	Advanced Seed Technology	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A702	Applied Weed Management	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A703	Vermi-composting and Organic farming	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A704	Soil, Plant and Water Analysis	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A705	Soil Management	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A706	Dairy Cattle Production	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A707	Plant Growth regulators in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG A708	Plasticulture in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
GROUP B: PLANT SCIENCE AND PLANT PROTECTION (any six papers are to be opted)									
AG B 701	Advanced Seed Technology	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 702	Tissue culture and Micro-propagation techniques	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 703	Bio-agents and Integrated Disease Management	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 704	Detection and Management of seed borne pathogens	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 705	Non –Insect Pests and their management	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 706	Bio-control agents and Bio-pesticides	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 707	Plant Growth regulators in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG B 708	Economic Nematology	ELECTIVE	1	4	30	70	50	150	3(1+2)
GROUP C: HORTICULTURE AND ALLIED SCIENCES (any six papers are to be opted)									
AG C 701	Bio-control agents and Bio-pesticides	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 702	Vermi-composting and Organic farming	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 703	Tissue culture and Micro-propagation techniques	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 704	Plasticulture in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 705	Nursery Management of Horticultural Crops	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 706	Commercial Vegetable Production	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 707	Commercial Fruit Production	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG C 708	Plant Growth regulators in Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)

GROUP D: SOCIAL SCIENCES (any six papers are to be opted)									
AG D 701	Marketing Management	ELECTIVE	2	2	30	70	50	150	3(2+1)
AG D 702	Project Formulation, Evaluation and Monitoring	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 703	Natural Resource Economics and Management	ELECTIVE	2	2	30	70	50	150	3(2+1)
AG D 704	Visuals and Graphic Communications	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 705	Govt. Policies and Priogrammes on Agriculture	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 706	Sampling Techniques	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 707	Dairy Cattle Production	ELECTIVE	1	4	30	70	50	150	3(1+2)
AG D 708	Poultry Production and Management	ELECTIVE	1	4	30	70	50	150	3(1+2)
TOTAL			**6**	**24**				**1200**	**18**
***A student has to opt for six courses of 18 credits out of eight listed in any one of the group.**									
***Passing marks will be 40% for individual paper and 50% in a semester aggregate**									

AG A701: Advanced Seed Technology 3(1+2)

Theory:

Heterosis: Inbred line production and maintenance, Production of inbreds by various methods, Evaluation of inbreds,Maintenance of inbreds,Production of hybrids,Emasculation techniques.

Use of male sterility, Use of self incompatibility, Maintenance of MS lines, Production of composites and synthetics, Exploitation of apomixes, Visit to seed production units

Seed technology: Setting up of Seed testing laboratory, Different tests of seed quality for seed legislation, Awareness of seed processing equipment, Setting up of seed processing unit, Visit to different seed processing units. **Seed marketing:**Setting up of marketing units, Economics of seed production, Supply chain management, Storage and packaging, Obtaining Licenses for seed production and processing units., Private and public seed production systems. Risk factor analysis in seed business.Model crops for seed production-Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices.

Practical:

Different methods of emasculation .Setting up of Seed testing laboratory.Different tests of seed quality for seed legislation. Awareness of seed processing equipment. Model crops for seed production. Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices. Setting up of seed processing unit. Visit to seed production units. Visit to different seed processing units. Demonstration/visit of inbred plots.

References:

1. Agarwal, R.L.2003.Seed Technology, Oxford & IBH Publishing pvt. Ltd. New Delhi
2. Arya, P.S. 2001. Vegetable Breeding and Seed Production. Kalyani Pub., Ludhiana
3. Khare and Bale.2007. Seed Technology. Scientific Publisher (India), Jodhpur
4. Mukharjee, S. The Heterosis Phenomenon. Kalyani Pub., Ludhiana
5. Sreenivas, V.S.2009. Seed Technilogy and Seed Pathology. Oxford Book Comp, Jaipur
6. Saxena,R.P.1984. Beez Sansadhan, GBPA&T, Pantnagar.

AG A702: Applied Weed Management 3(1+2)

Theory:

Weed: definition, damages caused; Elements of weed prevention and control; Concept of Integrated weed management ; Physical weed control methods: manual, mechanical and soil solarization; Weed control through agronomic practices; Biological weed control : Classical approach and bio- herbicides, Herbicidal control; Classes and methods of herbicide application; Sprayers: components and calibration. Weed management in field crops viz., paddy, wheat, maize and millets, groundnut, linseed, rapeseed and mustard, soybean, chickpea, pigeonpea, lentil, sugarcane, cotton, cumin, fenugreek, Lucerne, berseem and vegetable crops; Control of parasitic weeds viz, *Striga, Orobanchae, Cuscutta* , and *Loranthus.*

Practical:

Identification and preservation of seasonal and perennial weeds; Practice in manual and mechanical weed control and use of improved implements; Acquaintance with herbicides – their manufacturers and potential uses; Visit to weed control trials to record observations on density, intensity and dry matter; Herbicide application equipments and their calibration; Herbicide calculations; Herbicide spray in cropped and non- cropped area; Recording herbicide toxicity ; Economics of weed control; Qualitative and quantative analysis of weedy vegetation; Bioassay for herbicide residue estimation; Control of *Parthenium hysterophorous*; Visits to observe weed problems on farmers fields and aquatic ecosystem.

Reference:

1. Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T. 2003. Weed Management , ICAR, New-Delhi.
2. Gupta, O.P. 2005. Weed Management : Principles and Practices (2nd Ed.), Agribios (India), Jodhpur.
3. Shanmugavelu, K.G., Aravindan, R. and Rajagopal, A. 2004. Weed Management in Horticultural Crops , Agrobios (India), Jodhpur.
4. Gupta, O.P. 2008. Modern Weed Management , Agribios (India), Jodhpur
5. Das, T.K. 2008. Weed Science : Basics and Applications , Jain Brothers, New-Delhi.

AG A703: Vermi-composting and Organic Farming 3 (1+2)

Theory:

Vermicompost: Definition and objectives of vermitechnology. Importance of vermicomposting in utilization of Agriculture waste and organic recycling of nutrients. Classification of earthworm's. Method of preparation of vermicompost. Method and doses of vermicompost application for cereals, vegetables, tress and pots. Role of vermicomposting in organic farming and soil fertility. **Organic farming:** concept, definition, objectives and scope of organic farming. Role of organic farming in improving soil health and quality. Biofertilizers: Definition, importance of biofertilizers in organic farming and sustainability of soil fertility and productivity. Types of microbiological inoculants and method of application and doses.

Practical:

Identification of earthworms. Preparation of vermicompost. Separation and procurementof vermiculture and vermicompost. Analysis for quality standards and fractionation of vermicompost. Drawing of flow-sheet chart and preparation of vermicompost project. Measurement of changes in bulk density, infiltration rate, water holding capacity and organic carbon content of soil with the application of vermicompost. Determination of organic carbon, N, P and K content of soils under organic farming . Visits of organic farming fields. Identification of different strains of biofertilizers and isolation of rhizobium from nodules.

References:

1. Bhatnagar, R.K. and Palta, R.K. (2002). Vermiculture and vermicomposting. Kalyani Publishers, Ludhiana.
2. Motsara, M.R. Bhattacharyya, P., Srivastava, Beena (1955) Biofertilizers (Technology, Marketing and as age. Fertilizer development and consultation organization-New Delhi.
3. Thompson, J.A. (1984). Production and quality control of carrier based legume inoculants.
4. Indian standards institution (1986). Indian Standard Specification for Rhizobium inoculants.

AG A704: Soil Plant and Water Analysis 3 (1+2)

Theory:

Principle of pH meter, EC meter, spectrophotometer, flame photometer and A A S Soil analysis: Objectives, Sampling of soil, procedure and precautions. Interpretation of analytical data and nutrient index Plant analysis: Sampling, stages and plant part to be sampled .Total plant analysis, Quantitative rating of plant analysis data and interpretation of results, critical nutrient concentration (CNC), critical nutrient range (CNR). Nutrient use efficiency. Rapid plant tissue test for N, P, K and their interpretation for fertilizer recommendation,. Visual diagnostic criteria for the nutrient deficiency and toxicity of plants. Errors in soil and plant analysis. Classification and minimization of errors. Water analysis: Quality criteria, classification and suitability of irrigation water and water quality index

Practical:

Standardization of solutions and reagents, collection and preparation of soil samples, estimation of pH, EC, organic carbon, NPKS, micronutrients, CEC and exchangeable sodium in soil. Determination of EC and pH of saturation extract / paste. Estimation of cations (Ca^{++}, Mg^{++} and $Na^{+)}$ and anions ($CO3^{--}$ and $HCO3^{-)}$ in saturation extract . Plant sampling and sample preparation for analysis, digestion of plant material and estimation of N, P, K in plant. Rapid plant tissue test for N, P and K Determination of EC, pH, cations (Ca^{++} +Mg^{++} , Na^{+} , K^{+}) and anions ($CO3^{--}$, $HCO3^{-}$,Cl^{-}) in irrigation water and. Computation of S A R and R S C .

References:

1. T.D. Biswas and S.K. Mukherjee 1995. Text book of Soil Science (2nd Ed.) Tata Graw Hill Publishing Company Limited, New Delhi.
2. M.L. Jackson 1973. Soil Chemical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi. 4.H.L.S. Tandon 1990. Methods of Analysis of soil, plant, water and fertilizers, FDCO, New Delhi.
3. Tisdale, W.L. Nelson and J.D. Beaton, 1990. Soil Fertility and Fertilizers Macmillan Publishing Company, New York
4. P. K. Gupta 1999-2000. Soil, Plant, Water and Fertilizer Analysis, AgroBotanica, Bikaner.
5. Richards, L.A. (1954). Diagnosis and improvement of saline and alkali soils. USDA Hand book No. 60, Washington, DC USA.

AG A705: Soil Management 3 (1+2)

Theory:

Soil resources of India; distribution of wasteland and problematic soils with special reference to Rajasthan; soil tilth management; soil crusting and its management; management of soil moisture under different climates; effect of water quality on soils and plants; soil aeration problems and management; soil thermal regimes in relation to crops and their optimization.

Recycling of agricultural and industrial wastes, waste land and their management; reclamation and management of acidic, saline and sodic soils, constraints and management of highly and slowly permeable soils; soil erosion, extent, type and effects, soil conservation technique, water harvesting techniques and watershed management, remote sensing for soil and watershed management.

Practical:

Determination of saturated hydraulic conductivity, bulk density measurement of soil measurement of water holding and field capacities of soil, measurement of infiltration rate and moisture retention characteristics curve in normal, problematic and reclaimed soils. Preparation of saturation paste and saturation extracts of salt affected soils. Determination of pH, EC, cations and anions in saturation extract. Determination of $CaCO_3$ equivalent of liming material. Estimation of lime requirement of acid soils and gypsum requirement of sodic soils. Measurement of ODR of soil. Estimation of water stable aggregate in soil and field trip to study the areas of problematic soils.

References:

1. Abrol, I.P. and Dhurva narayana, V.V. (1998) Technologies for wasteland development, ICAR, New Delhi-110012
2. Agarwal, R.R., Yadav, J.S.P. and Gupta, R.N. (1982). Saline Alkali soils of India, ICAR, New Delhi.
3. Biswas, T.D. Naryanswami, G, Goswami, N.R; Sekhon, G.S. and Shastry, T.G. (1991). Soil related constraints in crop production. Tech. Bull. No. 15. Indian Society of Soil Science, New Delhi.
4. Biswas, T.D. and Mukharjee, S.K. (1990). Text book of soil science, Tata Mc Graw till publishing co. Ltd. New Delhi.
5. Cirsan Paul, J.(1985) Principles of remote sensing. Longman, New York.
6. Lal, P.; Chhipa, B.R. and Purohit, A.K. (1994). Salt affected soils- A modern synthesis Agro, Botanical publisher, Bikaner
7. Richards, L.A. (1954). Diagnosis and improvement of saline and alkali soils. USDA Hand book No. 60, Washington, DC USA.
8. Somani, L.L. and Totawat, K.L. (1993). Management of salt affected soils and waters. Agrotech publishing Academy, Udaipur.

AG A706: Dairy Cattle Production 3(1+2)

Theory:

Importance of dairying. Important milch breeds of cattle and buffalo. Selection, purchase and insurance of dairy animals. Scientific management of calves, heifers, bull calves, dry, pregnant and lactating dairy animals.Least cost ration formulation. Systems of breeding. Factors affecting productive and reproductive efficiency of dairy animals.

Practical:

Selection of site for dairy farm.Layout of dairy farm building.Computation and formulation of milk replacer, calf starter, concentrate mixture for lactating, pregnant and dry animals. Computation of balance ration for various categories of dairy animals. Physical and chemical treatment of low quality roughages. Plan for supplying green fodder throughout the year.Vaccination in various categories of dairy animals. Dehorning in dairy calves. Castration of male calves. Control of ecto and endo parasites. Colostrums and its utility. Weaning and rearing of dairy calves. Determination of age of animal. Care and management of dairy calves. Management of lactating, dry and pregnant cows. Dairy hygiene. Clean milk production and its marketing. Cleaning and sanitization of dairy equipments. Milking machine and its operation. Management of milch animals during adverse climatic conditions. Symptoms of estrus in dairy animals. Pregnancy diagnosis. Artificial insemination and its importance. Hay and silage making. Temperature, pulse and respiration rate in dairy animals.

References:

1. Banerjee, G. C. 2011. A Text Book of Animal Husbandr.VIII ed.Oxford and IBH Publications. New Delhi.
2. ICAR. 2011. Hand Book of Animal Husbandry published by DIPA, ICAR, New Delhi.
3. Ranjan, S.K.1994 AnimalNutrition and Feeding Practices. Vikash Publications. New Delhi.
4. Singh, R A 1985. Poultry Prodution. Kalyani Publications.New Delhi.
5. Sukumar, De. 2000. Outlines of dairy technology. Oxford University Press,New Delhi.
6. Thomas, C.K., Sastry NSR and Singh, RA. 1982.Farm Animal Management and Poultry Production.Vikash Publications. New Delhi.

AG A707: Plant Growth Regulators in Agriculture 3 (1+2)

Theory:

Introduction and historical background of Plant growth regulators. Classification of plant hormones and their synthetic analogues. Surfactants – Physiology and performance. Plant hormones vis-à-vis control of flowering and sex expression. Role of plant hormone in seed, fruit and grain formation. Weed control and plant hormones. Economic and social aspects of PGRs applications

Practical:

Methods of application of synthetic plant hormones and precautions. Doses, responses and growth stages for the application of hormones. Plant hormones and propagation through cell, tissue, organ culture and differentiation. Plant hormones vis-à-vis seed and propagule storage. Abiotic and biotic stress management through plant hormones. Vist to orchards for demonstration of flower and fruit drop and their control measures.

References:

1. Krishanamurthy, H.N. (1994) Plant growth and development Narosa Publication, New Delhi.
2. Kumar Arvind and Purohit S.S. (1996) Plant Physiology, Agrobotanica Publishers, Jodhpur.

AG A708: Plasticulture in Agriculture 3(1+2)

Theory:

Introduction of Plasticulture, Types and quality of plastics used in agriculture, Quality control measures, Present status and future prospective of plasticulture in India, Use of plastics in water management and in -situ moisture conservation, Plastic pipes for sub-surface drainage, Plastic film lining in canal, pond or water reservoir. Plastic mulch technique, Use of plastic in nursery raising, Plastics as cladding material for controlled environmental cultivation- poly houses, shade net houses, poly tunnels, low tunnels and crop covers. Plastic nets for crop protection - anti insect nets, bird protection nets. Plastic fencing. Innovative packaging solutions-leno bags, carets, vacuum packing .Plastic cap covers for storage of food gain in open. Use of plastics in farm equipments and machineries - sprayers, seed drill tubes and other spare parts of equipments and machineries. Plastic vermi-beds. Silage film technique for fodder preservation. Agencies involved in the promotion of plasticulture at national and state level.

Practical:

Study of sub- surface drainage system model, design of farm pond and estimation of plastic film, laying and flushing of drip laterals, plastic mulch laying, construction of low tunnels, use of leno bags, design, installation and cost estimate of cap cover, use of plastic in nursery under anti insect/ bird protection net, use of plastic vermi-bed, use of silage film for fodder preservation, visit to a nearby- PVC pipe manufacturing unit/dealer/ farmer' s field, sprinkler manufacturing unit/ dealer, poly house, shade net house.

Reference:

1. Rathi Gopal.L. 1997. Guide to Plastics. Maharashtra Plastic Manufacturers Association, Pune
2. Green House Management. A Training Manual of International Horticulture Innovation and Training Centre, Durgapura, Jaipur
3. Green House Designs and Environmental Control- A manual of NCPAH, DAC, Ministry of Agri. And Cooperation, Govt of India.
4. Pandey P.H1998. Principles and Practices of Post-Harvest Technology. Kalyani Publishers, New Delhi.

AG B701: Advanced Seed Technology 3(1+2)

Theory:

Heterosis: Inbred line production and maintenance, Production of inbreds by various methods, Evaluation of inbreds,Maintenance of inbreds,Production of hybrids,Emasculation techniques.

Use of male sterility, Use of self incompatibility, Maintenance of MS lines, Production of composites and synthetics, Exploitation of apomixes, Visit to seed production units

Seed technology: Setting up of Seed testing laboratory, Different tests of seed quality for seed legislation, Awareness of seed processing equipment, Setting up of seed processing unit, Visit to different seed processing units. **Seed marketing:**Setting up of marketing units, Economics of seed production, Supply chain management, Storage and packaging, Obtaining Licenses for seed production and processing units., Private and public seed production systems. Risk factor analysis in seed business.Model crops for seed production-Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices.

Practical:

Different methods of emasculation .Setting up of Seed testing laboratory.Different tests of seed quality for seed legislation. Awareness of seed processing equipment. Model crops for seed production. Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices. Setting up of seed processing unit. Visit to seed production units. Visit to different seed processing units. Demonstration/visit of inbred plots.

References:

1. Agarwal, R.L.2003.Seed Technology, Oxford & IBH Publishing pvt. Ltd. New Delhi
2. Arya, P.S. 2001. Vegetable Breeding and Seed Production. Kalyani Pub., Ludhiana
3. Khare and Bale.2007. Seed Technology. Scientific Publisher (India), Jodhpur
4. Mukharjee, S. The Heterosis Phenomenon. Kalyani Pub., Ludhiana
5. Sreenivas, V.S.2009. Seed Technilogy and Seed Pathology. Oxford Book Comp, Jaipur
6. Saxena,R.P.1984. Beez Sansadhan, GBPA&T, Pantnagar.

AG B702: Tissue Culture and Micro Propagation Techniques 3 (1+2)

Theory:

Setting up of commercial micro propagation unit - Lab and hardening unit design, Equipment, lab wares and consumables, Energy requirement and use of alternate energy sources. Man power requirement, Biosafety measures and waste disposal, Legislative requirement and govt. incentive. Major techniques in micro propagation- Axillary enhancement, Automated somatic embryogenesis systems, Synthetic seeds, Hardening procedures, Sterilization procedure and clean air environment, Risk factor analysis, Handling of contamination, Packaging and transportation, Marketing and Supply chain management, Economics of micropropagation, Material procurement, Stores handling, Cost reduction during production and hardening. GMP and HACCP requirement. Visit to commercial production units and case studies.

Practical:

Lab and hardening unit design. Familiarity with equipments, lab wares and consumables. Procedures of autoclaving, Media preparation Explant preparation, Surface sterilization, Axillary bud, nodal explant culture, experiments to induce somatic embryos. Preparation of synthetic seeds, Experiments for hardening of in vitro explants. Visit to commercial Production units and case studies.

References:

1. Chawala H S (2000) Introduction to Plant Biotechnology. Oxford & IBH
2. Gupta, P. K. (2008) Elements of biotechnology Rastogi publications meerut
3. Ray V. Herren (2005)Introduction to biotechnology (An Agricultural revolution)
4. Shekhawat, MS (2011) Plant Biotechnology, In vitro princioles, Techniques and Applications, MJP Publishers, Chennai
5. Mascarenhas, A. F. (2008) Hand book of Plant tissue Culture, ICAR.

AG B703: Bio-agents and Integrated Disease Management 3(1+2)

Theory:

Introduction, definition and concepts of Integrated Disease Management. Components of IDM- physical, chemical, cultural, biocontrol, resistance and legislative methods. Different biocontrol agents-*Trichoderma*, *Pseudomonas* and *Bacillus.* Mass production of bioagents. Mechanism of action of biocontrol agents. Methods of application of bioagents. IDM in important crops - rice, wheat, cotton, rapeseed and mustard, chickpea, groundnut and potato.

Practical:

Preparation of culture media for fungi and bacteria. Isolation and purification of antagonistic fungi and bacteria from rhizosphere soil. *In vitro* evaluation of antagonism against pathogens. Mass multiplication of bioagents (*Trichoderma*, *Pseudomonas*, *Bacillus* spp.) in different liquid and solid media. Evaluation of fungitoxicity against pathogens. Bioefficacy of antagonists against important pathogens. Visit to biopestcide production units.

References

1. Campbell, R. 1989. Biological Control of Microbial Plant Pathogens. Cambridge Univ. Press, Cambridge.
2. Cook, R.J. and Baker, K.F. 1983. Nature and Practice of Biological Control of Plant Pathogens. APS, St. Paul, Minnesota.
3. Gupta, V.K. and Sharma, R.C. (Eds.). 1995. Integrated Disease Management and Plant Health. Scientific Publ., Jodhpur.
4. Mayee, C.D., Manoharachary, C., Tilak, KVBR., Mukadam, D.S and Deshpande Jayashree (Eds.). 2004.
5. Mukherjee, K.G., Tewari J.P., Arora, D.K. and Saxena, G. 1992. Recent Developments in Biocontrol of Plant Diseases. Aditya Books, New Delhi.
6. Nene, Y.L. and Thapliyal, P.N. 1993. Fungicides in Plant Disease Control. 3rd Ed., Oxford & IBH, New Delhi.
7. Singh, R.S. (2000). Plant Disease Management. Oxford and IBH, NewDelhi.

AG B704: Detection and Management of Seed-borne Pathogens 3(1+2)

Theory:

Importance of seed-borne pathogens. A brief account of seed-borne fungal, bacterial and viral pathogens. Seed transmission. Paths of infection – ovule, embryo, endosperm, seed-coat & pericarp infection and seed contamination. Seed health testing methods. Management of seed-borne pathogens- physical, cultural, chemical and biological methods. Quarantine laws and procedures for seed certification. Pest risk analysis.

Practical:

Inspection of dry seeds. Detection of seed-borne pathogens by Seed-Washing Test, Seedling-Symptom Test, Blotter Method and Agar Plate Method. Embryo-Count Method. Molecular techniques for detection of seed-borne pathogens (ELISA & PCR). Identification of common seed-borne fungi – *Alternaria, Colletotrichum, Drechslera, Fusarium* etc. under microscope. Effect of chemical and biological seed treatments on seed-borne pathogens.

References:

1. Agarwal, V.K. and Sinclair, J.B.1987. Principles of Seed Pathology. Vol. I & II. CRC Press. Inc.Boca Raton, Florida.
2. Hutchins, J.D. & Reeves, J.F. (Eds.). 1997. Seed Testing Progress towards the 21st Century. CABI, Wallington.
3. Jha, D.K. 1993. A Text Book on Seed Pathology. Vikas Publ. House Pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi.
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5. Maude, R.B. 1996. Seed-borne diseases and their control. CAB International, UK.
6. Neerguard, P. 1988. Seed Pathology. Vol. I & II. Macmillan Press, UK.
7. Suryanayana, D. 1978. Seed Pathology. Vikas Publishing House Pvt. Ltd. 576, Masjid Road, Jangpura, New Delhi-110014.
8. Vishunavat, Karuna. 2007. Seed Health Testing – Principles & Protocols. Kalayani Publs.,24-Daryaganj, New Delhi-110002.

AG B705: Non-Insect Pests and Their Management 3 (1+2)

Theory:

Rodents: Rodent pests of agricultural importance. Field and storage losses due to rodents. Taxonomy, distribution, habitat behavior, burrowing pattern and breeding potential. Methods of rodent management in field and godowns- mechanical, physical, biological, chemical (rodenticides, fumigants etc.). Bait shyness and bait preference,. Other methods- sanitation, rodent proof structures, electromagnetic repellents etc. **Agricultural Ornithology:** Important phytophagous bird species in India, potential losses, host range, feeding behaviour and management. **Snails and Slugs:** Important species of agricultural importance. **Mammal pests:** Major mammals of agricultural importance, nature of damage and management. **Phytophagous mites:** General morphology and biology. Important species of mites of Agricultural importance *(Petrobia latens, Larvacarus transitans, Eutetranychus orientalis* and *Tetranychus cinnabarinus),* nature and extent of damage and their management.

Practical:

Identification of important rodent species in different habitats. Burro w patterns and feeding habits o f important rodent species . Assessment and monitoring rodent pest population.Study of rodenticides Study of mechanical method of rodent control Pre-baiting, baiting and their application. Fumigation of burrows. Rodent management in field crops, threshing floors and godowns. Placement of baits, evaluation and efficacy of baits.Organization of rodent control campaigns. Identification and food habits of birds associated with agricultural crops. Crop protection measures for birds: traditional and modern methods. Study of external morphology of phytophagous mite species. Diagnostic study of symptoms caused by different groups of mites. on different crops. Study of different acaricides. Study of major mammalian pests.Study of snails and slugs.Visit to zoological museum.

References:

1. Barnes, Edwin, H.1981.The birds of India: A guide to Indian Ornithology, Cosmo publication, New Delhi.
2. Bhargava, M.C. and Kumawat, K.C. 2010. Pests of stored grains and their management, New India Publishing Agency, New Delhi.
3. Iswar Prakash, 1992. Rodents in Indian Agriculture, Vol. 1. Scientific Publishers, Jodhpur.

AG B706: Bio-control Agents and Bio-pesticides 3 (1+2)

Theory:

Definition, concept and principles of biological control. Attributes of an effective natural enemies. Types of natural enemies- Parasitoids and predators. Techniques of biological control. Microbial control- Pathogenicity, virulence and factors that enhance the use of microorganisms. Classification, mode of action and uses of microbial agents, factors influencing their effectiveness. Advantages and limitations of biological control in IPM. Role of biological control in IPM. Mass production and multiplication of biocontrol agents- viruses, bacteria, fungi and parasitoids and predators and their application techniques. Potential of plant products in IPM.

Practical:

Handling, maintenance and upkeep of equipments related to biological control. Identification of important biological agents. Mass rearing techniques of important host insects of parasitoids (one field and one storage Lepidopteran pest).Mass rearing techniques and inundative release of important parasitoids - *Trichogramma* sp./ *Campoletis chlorideae.* Mass rearing technique of important predators- Lady bird beetle and green lacewing.Collection and preservation of bio-agents. Mass production of NPV, Bt and *Metarrhizium anisopliae.* Field visit to study the behavior of natural enemies and their collection. Visits of mass production and biological control centers of national repute. Preparation of neem seed kernel extract.

References:

1. DeBach,P. 1974. Biological control by Natural enemies. Cambridge University Press.
2. Manfred Mackaur, Laster E.Ehler and Jens Roland. 1990. Critical Issues in Biological control-Intercept Ltd.
3. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin -4.
4. Rabindra, R.J., Kennedy, J.S., Sathaiah, N., Rajasekharan, B. and Srinivasan, M.R. 2001. Microbial control of crop pests . TNAU .
5. Dhaliwal GS & Arora R. 2001. *Integrated Pest Management: Concepts and Approaches.*KalyaniPubl., New Delhi.
6. Dhaliwal, GS & Koul O. 2007. *Biopesticides and Pest Management*. Kalyani Publ., New Delhi.
7. Gautam, R.D. Biological Pest Suppression, Westvill Publising Co., New Delhi.

AG B707: Plant Growth Regulators in Agriculture 3 (1+2)

Theory:

Introduction and historical background of Plant growth regulators. Classification of plant hormones and their synthetic analogues. Surfactants – Physiology and performance. Plant hormones vis-à-vis control of flowering and sex expression. Role of plant hormone in seed, fruit and grain formation. Weed control and plant hormones. Economic and social aspects of PGRs applications

Practical:

Methods of application of synthetic plant hormones and precautions. Doses, responses and growth stages for the application of hormones. Plant hormones and propagation through cell, tissue, organ culture and differentiation. Plant hormones vis-à-vis seed and propagule storage. Abiotic and biotic stress management through plant hormones. Vist to orchards for demonstration of flower and fruit drop and their control measures.

References:

1. Krishanamurthy, H.N. (1994) Plant growth and development Narosa Publication, New Delhi.
2. Kumar Arvind and Purohit S.S. (1996) Plant Physiology, Agrobotanica Publishers, Jodhpur.

AG B708: Economic Nematology 3(2+1)

Theory:

Objectives: to impart the basic and practical knowledge related with economic importance of nematodes in field and horticulture crop.historical perspectives, economic importance and symptoms of nematode disease in plants, nematode disease of field crops..cerials, ear cockle and yellow ear rot disease of wheat, molya disease of wheat and barley, maize cyst, nematodes disease, nematode disease of vegetables (root knot, reniform disease of tomato brinjal, potato, chilli, cucumber, fruits (root knot nematodes and reniform nematodes of papaya, banana etc). phytonematodes management in field/horticulture crop management, strategies with cultural, physical, chemical, biological breeding for management and integrated nematode etc.

Practical:

Diagnosis of economic important disease in state, survey and surveillance and collection of soil and plant samples in nematode infested fiels of various crops, extraction of nematode from soil and plant samples.preparation of semi permanent mount of suspension, identification of various strategies of semi-endo and endo parasitic nematodes of economic importance.;study of pathogenic level of phytonematodes in crops.study of apparatus/equipments use during chemical control strategies;calculation of recommended dose of nematodes/bioagents.

Reference:

1. Bhati, D. s and Wallia 1992. Nematode pests of crops. C.B.S, PUBLICATION NEW DELHI

2. SHARMA, G.L. 2009. PHYTONEMATODE MANAGEMENT IN FIELD CROPS. Oxford Book Co. Jaipur

AG C701: Bio-control Agents and Bio-pesticides 3 (1+2)

Theory:

Definition, concept and principles of biological control. Attributes of an effective natural enemies. Types of natural enemies- Parasitoids and predators. Techniques of biological control. Microbial control- Pathogenicity, virulence and factors that enhance the use of microorganisms. Classification, mode of action and uses of microbial agents, factors influencing their effectiveness. Advantages and limitations of biological control in IPM. Role of biological control in IPM. Mass production and multiplication of biocontrol agents- viruses, bacteria, fungi and parasitoids and predators and their application techniques. Potential of plant products in IPM.

Practical:

Handling, maintenance and upkeep of equipments related to biological control. Identification of important biological agents. Mass rearing techniques of important host insects of parasitoids (one field and one storage Lepidopteran pest).Mass rearing techniques and inundative release of important parasitoids - *Trichogramma* sp./ *Campoletis chlorideae.* Mass rearing technique of important predators- Lady bird beetle and green lacewing.Collection and preservation of bio-agents. Mass production of NPV, Bt and *Metarrhizium anisopliae.* Field visit to study the behavior of natural enemies and their collection. Visits of mass production and biological control centers of national repute. Preparation of neem seed kernel extract.

References:

1. DeBach,P. 1974. Biological control by Natural enemies. Cambridge University Press.
2. Manfred Mackaur, Laster E.Ehler and Jens Roland. 1990. Critical Issues in Biological control-Intercept Ltd.
3. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin -4.
4. Rabindra, R.J., Kennedy, J.S., Sathaiah, N., Rajasekharan, B. and Srinivasan, M.R. 2001. Microbial control of crop pests . TNAU .
5. Dhaliwal GS & Arora R. 2001. *Integrated Pest Management: Concepts and Approaches.*KalyaniPubl., New Delhi.
6. Dhaliwal, GS & Koul O. 2007. *Biopesticides and Pest Management*. Kalyani Publ., New Delhi.
7. Gautam, R.D. Biological Pest Suppression, Westvill Publising Co., New Delhi.

AG C702: Vermi-composting and Organic Farming 3 (1+2)

Theory:

Vermicompost: Definition and objectives of vermitechnology. Importance of vermicomposting in utilization of Agriculture waste and organic recycling of nutrients. Classification of earthworm's. of vermicompost application for cereals, vegetables, tress and pots. Role Method of preparation of vermicompost. Method and doses of vermicomposting in organic farming and soil fertility. **Organic farming:** concept, definition, objectives and scope of organic farming. Role of organic farming in improving soil health and quality. Biofertilizers: Definition, importance of biofertilizers in organic farming and sustainability of soil fertility and productivity. Types of microbiological inoculants and method of application and doses.

Practical:

Identification of earthworms. Preparation of vermicompost. Separation and procurementof vermiculture and vermicompost. Analysis for quality standards and fractionation of vermicompost. Drawing of flow-sheet chart and preparation of vermicompost project. Measurement of changes in bulk density, infiltration rate, water holding capacity and organic carbon content of soil with the application of vermicompost. Determination of organic carbon, N, P and K content of soils under organic farming . Visits of organic farming fields. Identification of different strains of biofertilizers and isolation of rhizobium from nodules.

References:

1. Bhatnagar, R.K. and Palta, R.K. (2002). Vermiculture and vermicomposting. Kalyani Publishers, Ludhiana.
2. Motsara, M.R. Bhattacharyya, P., Srivastava, Beena (1955) Biofertilizers (Technology, Marketing and as age. Fertilizer development and consultation organization-New Delhi.
3. Thompson, J.A. (1984). Production and quality control of carrier based legume inoculants.
4. Indian standards institution (1986). Indian Standard Specification for Rhizobium inoculants.

AG C703: Tissue Culture and Micro Propagation Techniques 3 (1+2)

Theory:

Setting up of commercial micro propagation unit - Lab and hardening unit design, Equipment, lab wares and consumables, Energy requirement and use of alternate energy sources. Man power requirement, Biosafety measures and waste disposal, Legislative requirement and govt. incentive. Major techniques in micro propagation- Axillary enhancement, Automated somatic embryogenesis systems, Synthetic seeds, Hardening procedures, Sterilization procedure and clean air environment, Risk factor analysis, Handling of contamination, Packaging and transportation, Marketing and Supply chain management, Economics of micropropagation, Material procurement, Stores handling, Cost reduction during production and hardening. GMP and HACCP requirement. Visit to commercial production units and case studies.

Practical:

Lab and hardening unit design. Familiarity with equipments, lab wares and consumables. Procedures of autoclaving, Media preparation Explant preparation, Surface sterilization, Axillary bud, nodal explant culture, experiments to induce somatic embryos. Preparation of synthetic seeds, Experiments for hardening of in vitro explants. Visit to commercial Production units and case studies.

References:

1. Chawala H S (2000) Introduction to Plant Biotechnology. Oxford & IBH
2. Gupta, P. K. (2008) Elements of biotechnology Rastogi publications meerut
3. Ray V. Herren (2005)Introduction to biotechnology (An Agricultural revolution)
4. Shekhawat, MS (2011) Plant Biotechnology, In vitro princioles, Techniques and Applications, MJP Publishers, Chennai
5. Mascarenhas, A. F. (2008) Hand book of Plant tissue Culture, ICAR.

AG C704: Plasticulture in Agriculture 3(1+2)

Theory:

Introduction of Plasticulture, Types and quality of plastics used in agriculture, Quality control measures, Present status and future prospective of plasticulture in India, Use of plastics in water management and in -situ moisture conservation, Plastic pipes for sub-surface drainage, Plastic film lining in canal, pond or water reservoir. Plastic mulch technique, Use of plastic in nursery raising, Plastics as cladding material for controlled environmental cultivation- poly houses, shade net houses, poly tunnels, low tunnels and crop covers. Plastic nets for crop protection - anti insect nets, bird protection nets. Plastic fencing. Innovative packaging solutions-leno bags, carets, vacuum packing .Plastic cap covers for storage of food gain in open. Use of plastics in farm equipments and machineries - sprayers, seed drill tubes and other spare parts of equipments and machineries. Plastic vermi-beds. Silage film technique for fodder preservation. Agencies involved in the promotion of plasticulture at national and state level.

Practical:

Study of sub- surface drainage system model, design of farm pond and estimation of plastic film, laying and flushing of drip laterals, plastic mulch laying, construction of low tunnels, use of leno bags, design, installation and cost estimate of cap cover, use of plastic in nursery under anti insect/ bird protection net, use of plastic vermi-bed, use of silage film for fodder preservation, visit to a nearby- PVC pipe manufacturing unit/dealer/ farmer' s field, sprinkler manufacturing unit/ dealer, poly house, shade net house.

Reference:

1. Rathi Gopal.L. 1997. Guide to Plastics. Maharashtra Plastic Manufacturers Association, Pune
2. Green House Management. A Training Manual of International Horticulture Innovation and Training Centre, Durgapura, Jaipur
3. Green House Designs and Environmental Control- A manual of NCPAH, DAC, Ministry of Agri. And Cooperation, Govt of India.
4. Pandey P.H1998. Principles and Practices of Post-Harvest Technology. Kalyani Publishers, New Delhi.

AG C705: Nursery Management of Horticultural Crops 3(1+2)

Theory:

Present status and future scope of nurseries. Recent trends in planning and layout of nurseries and progeny orchard. Principles and methods of propagation by seed, specialized vegetative structures, cutting, layering, grafting, budding and in vitro propagation. Use of PGRs in plant propagation. Propagation structures Economics of raising nursery. Nursery regulation certification.

Practical:

Identification of propagation material and equipment. Layout of nurseries and management of progeny orchard. Use of protrays and root trainers in vegetable nursery. Raising and maintenance of root stock. Multiplication of plants by sexual methods. Raising of seedlings. Propagation by cuttings in Horticultural crops. Propagation by budding in Horticultural crops. Propagation by grafting in Horticultural crops. Use of plant growth regulators in propagation. Potting, repotting or lifting of saplings (packaging) for transportation. Use of propagation media. Tetrazolium salt test for determining germination. Visit of commercial nurseries. Project preparation for nursery. Procurement of inputs. Techniques of environment management for large scale production. Care of nursery plant and management of insect, pest and diseases. Visit to commercial orchard and diagnosis of maladies.

References:

1. Bose, T.K. Mitra, SK and Sandhu MK (1986). Propagation of tropical & sub-tropical horticultural crops, Naya Prakash, Calcutta.
2. Hartman, HT and Kester, DE (1986). Plant propagation principles and practices. Prentice Hall of India Pvt. Ltd., Bombay
3. Gill, SS. Bal, JS and Sadhu, AS (1985). Raising Fruit Nursery, Kalyani Publishers, New Delhi.

AG C706: Commercial Vegetable Production 3(1+2)

Theory:

Importance, scope and export potential of commercial vegetables in India. Importance , origin, history, area, distribution, taxonomy, recent trends of the commercial vegetables. F1-hybrids, commercialvarieties, nutritional requirement, irrigation, inter-cultural operations, weed control, mulching, plant protection of important commercial vegetables, solanaceous, okra, bulb crops, cucurbits, cowpea, amaranthus and clusterbean. Off season cultivation of important commercial vegetables . Organic vegetable production..

Practical:

Identification and botanical description of important commercial vegetables, their varieties & seeds. Estimation of viability and germinatin percentage and real value of seeds. Practice of emasculation, selfing and crossing in various vegetable crops. Seed production in root crops, cauliflower, onion, tomato and cucurbits. Planting of roots of radish, carrot and turnip for seed production. Preparation of cropping scheme for commercial vegetable growers/farms. Preparation of nursery beds, seed treatment and sowing of seeds in beds. Sowing of seeds in polythene bags/ pro-trays. Seedling preparation in pro-trays and management in Net house. Transplanting of seedlings, sowing of cucurbits in field. Growing of vegetables with drip irrigation methods. Use of plastic mulch in vegetable production. Application of manures and fertilizers, liquid fertilizers and nutrient spray in vegetable crops. Inter-cultural operations in vegetable crops. Spray of pesticides, fungicides and use of PGRs. Study of physiological disorders in vegetables. Study of maturity standards and harvesting. Seed extraction techniques, pre cooling, washing, grading, packaging and storage of vegetable crops. Calculation of cost of production and B/C ratio. Identification of major pests, diseases and disorders. Study of storage techniques of vegetable crops.

References:

1. Chadha, K.L. and Kaloo, G Advances in Horticulture. Vol 5 & 6, Vegetable Crops. Malhotra Publishing House, New Delhi.
2. Choudhary, B. 1996. Vegetables, NBT, New Delhi.
3. Bose, T.K., Kabir, I., Maity, T.K., Parthasarthy, V.A. and Sons, M.G. 2006. Vegetable crops. Vol I, II and III. Singh, S.P. 1989. Production technology of vegetable crops. Agril. Resesearch, Communication Centre, Karnal.

AG C707: Commercial Fruit Production 3(1+2)

Theory:

Importance, present position and scope of fruit production. Classification, systematic study of fruits, Importance, origin, history, area, distribution and recent trends in the production technology of commercial fruit crops *viz*. Guava, Citrus, Mango, Beal, Ber, Aonla, Lehsua, Pomegranate, Papaya, Grapes and Date palm.

Practical:

Identification of important sub tropical and tropical fruits. Lay out of orchards. Different types of planting methods including high density planting and meadow orcharding. Preparation of soil mixture for nursery bed. Identification and uses of horticultural tools. Raising of rootstock. Practices on stratification and scarification of fruit seeds. Soil sterilization of nursery. Irrigation methods of fruits orchards with the emphasis on micro irrigation. Methods of fertilizer application of fruit crops and fertigation. Use of PGRs in fruit crops. Various methods of plant protection. Vegetative methods of propagation. Demonstration of different training methods. Demonstration of different pruning methods. Methods of moisture conservation and weed control in various fruit crops. Study of physiological disorders of fruit crops. Study of nutrient deficiency symptoms of fruit crops. Study of maturity indices of fruit crops. Calculation of water or irrigation requirement of fruit crops based on CPE. Visit to different fruit orchards of local region. Cost of cultivation of ber, Aonla, mango, kinnow, papaya etc. Pollination in date palm.

References:

1. Bal, J.S. 1997. Fruit Growing. Kalyani Publishers. New Delhi.
2. Bose, T.K., Mitra, S.K. and Rathore, D.S. (Eds.). 1988. Temperate Fruits- Horticulture. Allied Publication.
3. Bose, T.K., Mitra, S.K. and Sanyal, D. (Ed.). 2002. Fruits of India- Tropical and Subtropical. 3rd Ed. Vol. I, II. Naya Udyog.
4. Chadha, K.L. 2001. Handbook of Horticulture. ICAR Publication. New Delhi.
5. Chadha, K.L.and Pareek, O.P. (Eds.) 1996. Advances in Horticulture. Vol. I. Malhotra Publishing House. New Delhi.
6. Chundawat, B.S. 2002. Principles of Fruit Culture. Agrotech Publishing Academy.
7. Pradeep Kumar, T., Suma, B., Jyothibhaskar and Satheesan, K.N. 2008. Management of Horticultural Crops. New India Publishing Agency.
8. Radha, T. and Mathew, L. 2007. Fruit Crops. New India Publishing Agency.
9. Singh, Amar. 1992. Fruit Physiology & Production. Kalyani Publishers. New Delhi.

AG C708: Plant Growth Regulators in Agriculture 3 (1+2)

Theory:

Introduction and historical background of Plant growth regulators. Classification of plant hormones and their synthetic analogues. Surfactants – Physiology and performance. Plant hormones vis-à-vis control of flowering and sex expression. Role of plant hormone in seed, fruit and grain formation. Weed control and plant hormones. Economic and social aspects of PGRs applications

Practical:

Methods of application of synthetic plant hormones and precautions. Doses, responses and growth stages for the application of hormones. Plant hormones and propagation through cell, tissue, organ culture and differentiation. Plant hormones vis-à-vis seed and propagule storage. Abiotic and biotic stress management through plant hormones. Vist to orchards for demonstration of flower and fruit drop and their control measures.

References:

1. Krishanamurthy, H.N. (1994) Plant growth and development Narosa Publication, New Delhi.
2. Kumar Arvind and Purohit S.S. (1996) Plant Physiology, Agrobotanica Publishers, Jodhpur.

AG D701: Marketing Management 3(2+1)

Theory:

Marketing Management: Meaning, definitions, marketing, Mix, market segmentation, targeting & positioning, market information system, market orgaiation and control. 4P's of marketing, product life cycle. Marketing potential : Classification of products, new product development, product line, product mix, branding, packaging and labeling. Factors affecting on prices: Pricing policies, strategies and pricing methods. Types of distribution channels. Functions of channels, members and channel management decisions.

Practical :

Performance analysis of regulated market and Marketing societies. Price spread and Marketing efficiency analysis.

Reference: :

1. Marketing Management : V.S. Ramaswamy, S. Namakumari-Macmillian publishers India

AG D702: Project Formulation, Evaluation and Monitoring 3(1+2)

Theory:

Introduction to project: Meaning and definition, purpose, characteristics of a project, type of agriculture projects. Project cycle: Identification, formulation, appraisal, implementation, monitoring and evaluation. Project feasibility: Market feasibility, technical feasibility, financial and economic feasibility. Project appraisal techniques: Discounted and undiscounted techniques, compounding, payback period, annual return on investment, proceeds per unit of outlay, NPW, B-C ratio, IPR, profitability index, sensitivity analysis. Project monitoring and evaluation: Ex-ante evaluation, mid course evaluation and ex-post evaluation.

Practical:

Numerical exercises on techniques of project appraisals

References:

1. Agriculture finance and management : S. Subba Reddy & P. raghu Ram
2. Project management : P. Chandra, Tata MC GrawHill
3. Project management: Gopal Krishan & Nagarajan K.
4. Economic analysis of Agricultural Project: Gittinger J.P. The Johons Hoplkins Univ. Press

AG D703: Natural Resource Economics and Management 3 (2+1)

Theory:

Concept, Subject matter and importance of natural resource economics, Classifications of natural resources and basic terms and concepts of natural resource economics: ecology-ecosystem, biomass, biosphere, reserves, environment, pollution, etc. Natural resources management and conservation, issues in natural resources and management. Approaches to natural resource problems. Important issues in economics and management of land, water and forest resource and the environment. Factors mitigating natural resources scarcity. Natural resources administration and policy formulations. International environmental issues, climate change.

Practical:

Environmental impact assessment. Visit to pollution control board. Optimum harvest of forestry/fishery, exercise on pollution abatement.

References;

1. Environmental and natural resource economics: Theory, policy and the sustainable society: M.E. Sharpe, Armonk NY
2. The economics of natural resource use : Hartiwick JM and Olewiler ND
3. natural resource economics : Theory and applications in India- Korr JM, Marothia D.K., Katar Singh, Ramaswamy C. and Bentley WR.

AG D704: Visuals & Graphic Communication 3(1+2)

Theory:

Role of visuals & graphics in Communication. Characteristics of visuals &graphics. Functions of visuals and graphics. Classification and selection of visuals. Designing message for visuals and Graphics. Principles and production of low cost visuals like charts, posters, flash cards, exhibits, photographs slides and PC based visuals. Multimedia production. Preparation and presentation of multimedia slides.Pre-testing and evaluation of visuals. Scanning of visuals.

Practical:

Preparation of low cost projected and Non-Projected visuals. Designing and layout of charts, posters, flash cards etc. Power point presentations. Generating computer aided presentation graphics. Scanning and evaluation of visuals.

References:

1. James WB, Richard BL, Fried F Harcleroad. 1952. *A.V. Instructional Material & Methods*. Mc.Graw Hill.
2. Reddy YN. 1998. *Audio Visual Aids in Teaching, Training and Extension*. Haritha Publ. House, Hyderabad.

AG D705: Government Policies and Programmes on Agriculture 3(1+2)

Theory:

Indian situation of Agriculture at a glance. Issues and challenges in agricultural development in India. National Policy for Agricultural development since independence: Development programmes for agriculture with reference to year of start, objectives and salient features. Research, extension and teaching mechanism at national and state level with reference to agriculture, Public-Private Partnership.

Practical:

Preparation of interview schedule for conducting bench mark survey with special reference to demographic information of a nearby village. Visit of KVK / voluntary organization to study developmental activities related to agriculture. Field visit to a successful agriculture related enterprise. Study the functioning of State Department of Agriculture. Evaluation of any ongoing agricultural development programme. Social auditing of MNREGA.

References;

1. Subhalakshmi V. 2005. Globalization- Indian Experience. ICFAI Univ. Press, Hyderabad.
2. Bagchi J.2007. Agriculture and WTO opportunity for India.Sanskruti.
3. John KC, Sharma DK, Rajan CS and Singh C. 1997. Farmers Participation in Agricultural Research and Extension Systems. MANAGE, Concept Publi. Co.
4. Narasaiah ML. 2005. Agricultural Development and world Trade organization. Discovery Publ.
5. Dunn DD. 1978. Appropriate Technology with a Human Face. Mecmillan Press.
6. Kapoor SK, Roy PB & Roy AK. 1980. Role of Information centers in Technology Transfer. IASLIC, Kolakata.
7. Lekhi RK. 1984. Technological Revolution in Agriculture. Classical Publ. Co.
8. Ray GL.2006. Extension Communication and management. Kalayani Publ.
9. Supe SV. 2009. A Text Book of Extension Education. Agrotech Publishing Academy, Udaipur.
10. Viswanathan M. 1994. Women in Agriculture and Rural Development. Printwell Publ.

AG D706: Sampling Techniques 3(1+2)

Theory:

Sampling unit. Sampling frame, Principles of sample survey. main steps in survey, types of sampling, advantages of sampling over census, limitations of sampling; Sources and types of non-sampling errors, biases and variance error, non-sampling bias, non-coverage, incomplete frames and missing units; Simple random sampling with and without replacement. Stratified sampling. Systematic sampling; Cluster sampling, multi -stage sampling. Basic idea about ratio and regression estimators. NOTE : Mathematical derivations and proofs are excluded.

Practical:

Random sampling - use of random number tables. Determination of sample size, estimation of mean and variance of simple random sampling with and without replacement, stratified random sampling. Cluster sampling, two stage sampling, Ratio and Regression estimators, Efficiency of SRSWR over SRSWOR,. Estimation of gain in precision due to stratification. Relative efficiency of cluster sampling equal cluster over unequal cluster.

References:

1. Cochran, W.G. 1977. Sampling Techniques, John Wiley.
2. Murthy, M.N. 1977. Sampling Theory and Methods. 2"' Ed, statistical Publ.
3. Singh, D. Singh, P. and Kumar, P. 1982. Handbook on Sampling Methods, IASRI Pub I.
4. Sukhatme , S.V. and Ashok. C. 1984. Sampling Theory of Surveys with Applications. Iowa State university Press and Indian Society of Agricultural Statistics. New Delhi.

AG D708: Dairy Cattle Production 3(1+2)

Theory:

Importance of dairying. Important milch breeds of cattle and buffalo. Selection, purchase and insurance of dairy animals. Scientific management of calves, heifers, bull calves, dry, pregnant and lactating dairy animals.Least cost ration formulation. Systems of breeding. Factors affecting productive and reproductive efficiency of dairy animals.

Practical:

Selection of site for dairy farm.Layout of dairy farm building.Computation and formulation of milk replacer, calf starter, concentrate mixture for lactating, pregnant and dry animals. Computation of balance ration for various categories of dairy animals. Physical and chemical treatment of low quality roughages. Plan for supplying green fodder throughout the year.Vaccination in various categories of dairy animals. Dehorning in dairy calves. Castration of male calves. Control of ecto and endo parasites. Colostrums and its utility. Weaning and rearing of dairy calves. Determination of age of animal. Care and management of dairy calves. Management of lactating, dry and pregnant cows. Dairy hygiene. Clean milk production and its marketing. Cleaning and sanitization of dairy equipments. Milking machine and its operation. Management of milch animals during adverse climatic conditions. Symptoms of estrus in dairy animals. Pregnancy diagnosis. Artificial insemination and its importance. Hay and silage making. Temperature, pulse and respiration rate in dairy animals.

References:

1. Banerjee, G. C. 2011. A Text Book of Animal Husbandr.VIII ed.Oxford and IBH Publications. New Delhi.
2. ICAR. 2011. Hand Book of Animal Husbandry published by DIPA, ICAR, New Delhi.
3. Ranjan, S.K.1994 AnimalNutrition and Feeding Practices. Vikash Publications. New Delhi.
4. Singh, R A 1985. Poultry Prodution. Kalyani Publications.New Delhi.
5. Sukumar, De. 2000. Outlines of dairy technology. Oxford University Press,New Delhi.
6. Thomas, C.K., Sastry NSR and Singh, RA. 1982.Farm Animal Management and Poultry Production.Vikash Publications. New Delhi.

AG D708: Poultry Production and Management 3(1+2)

Theory:

Poultry breeds of economic importance. Formation and laying of egg. Systems of poultry rearing. Feeding and management of different categories of poultry. Common nutritional disorders of birds. Vaccination and deworming. Selection and culling of different classes of poultry. Formulation of poultry farm plan.

Practical:

Familiarity with external body parts of chicken. Handling and restraining of poultry birds. Selection of site for poultry farm. Layout of poultry farm buildings. Brooding, debeaking and vaccination of chicks. Internal structure and composition of egg. Collection, recording, grading, marketing and preservation of chicken eggs. Management of broilers. Dressing of birds. Incubation of eggs. Common feed ingredients. Feed additives used in poultry. Formulation of chick starter, grower and layer feed. Formulation of broiler starter and finisher feed. Cleaning and disinfection of poultry houses. Management of poultry farm under adverse climatic conditions. Economics of poultry farm.

References:

1. Banerjee, G. C. 20011. A Text Book of Animal Husbandr.VIII ed. Oxford and IBH Publications. New Delhi.
2. ICAR. 2011. Hand Book of Animal Husbandry published by DIPA, ICAR, New Delhi.
3. Ranjan, S.K.1994. Animal Nutrition and Feeding Practices. Vikash Publications. New Delhi.
4. Singh, R A 1985. Poultry Prodution. Kalyani Publications. New Delhi
5. Sukumar, De. 2000. Outlines of dairy technology. Oxford University Press,New Delhi.
6. Thomas C.K., Sastry NSR and Singh,RA. 1982. Farm Animal Management and Poultry Pdn, Vikash.Pub

IPR 4413: Intellectual Property Rights 2(2+0)

Theory:

General Regime of Intellectual Property RightsConcept of Property vis-à-vis Intellectual Property, Concept of Property and Theories of Property; Types of Intellectual Property-Origin and Development, Intellectual Property Rights as Human Right, World Intellectual Property Organization (WIPO), Trademarks

SD 4414 :Sustainable Development 2(2+0)

Theory:

Glimpses of agriculture around the world, Concepts of sustainability and sustainable agriculture, dimensions of sustainable agriculture,

The Earth Summit 1992, Johannesburg Summit 2002 – the World Summit on Sustainable, Development, Rio +20 2012, Concepts of poverty , Concept of Food Security , Examples of unsustainable agriculture , The Millennium Development Goals,

VAP 4416: Value addition in Pearl Millet 2 (1+1)

Theory:

Present scenario of pearl millet cultivation in India, Post harvest losses ,Value- added products of pearl, millet, Strategies for value addition, Emerging areas of agri-business, Indian corporate in agri-business.

Practical:

- Preparation of Bajra health food
- Preparation of Bajra health drink

POM 4417: Production of Organic Manures (1+1)

Theory :

Farm yard manure, green manures, compost prepared from crop residues and other farm wastes, vermicompost, PROM,oil cakes, and biological wastes.

Practical:

Preparation of FYM, Compost, Vermi-compost and PROM

ISD-4418 : Installation of Sprinkler and Drip irrigation unit

Theory:

Critical Appraisal of the Adaptability of Sprinkler Irrigation ,Advantages and Limitations of Sprinkler Irrigation, Types and Components of Sprinkler System, Design of Sprinkler Irrigation System, Design of Sprinkler Irrigation System , Evaluation of Rotating Head Sprinklers and Operation of Sprinkler System,

Drip Irrigation, Components of Drip Irrigation System-I, Description of Drip System Components and their Selection, Planning and Design of Drip Irrigation System, Evaluation of Drip Emitters and Design of Drip Irrigation System, Installation, Operation and Maintenance of Drip Irrigation Systems

Practical:

- Identification of components of sprinkler system
- Designing layout for sprinkler system
- Identification of components of drip irrigation
- Designing layout of drip irrigation system.

EIGHTH SEMESTER

EIGHTH SEMESTER COURSES (RAWE:RURAL AGRICULTURAL WORK EXPERIENCE))

THEORY PAPERS			**No. of Teaching Hours**		**Marks Allocation**				
					Theory		**Practical**		
Code	**Subject/Paper**	**Type**	**L**	**P**	**Internal**	**External**		**Total**	**Credits**
ITK 4420	Research Station/KVK/ including village attachment and In-situ interaction offarmers, students and research station scientists	SEC	0	12	-	-	300	300	6(0+6)
IITK4421	In-situ interaction of farmers, college faculty and students	SEC	0	4	-	-	100	100	2 (0+2)
ET 4423	Educational Tour	SEC	0	4	-	-	100	100	2(0+2)
PRP 4424	Project Report Preparation and Evaluation	SEC	-	-	-	-	-	-	Non Credit
IA 4425	Industrial Attachment*/Skill Development/ Experiential Learning Courses	SEC	0	24	-	-	400	400	8(0+8)
TOTAL				**44**				**900**	**18**
GRAND TOTAL									**165**

*** Credit Definition: One credit is defined as one-hour for lecture, 2 hours practical work per week.**

***The minimum credit requirement for the graduate degree should be 160 credits excluding non-credit courses for language, physical education/NCC/NSS**

***AECC: Ability Enhancement Compulsory Course**

***SEC: Skill Enhancement Course**

***L:Lecture Hours/Week**

Rural Agricultural Work Experience (RAWE)

Programme	**Duration (Weeks) credits**
Orientation	(Non Credit)
Research Station/KVK/ including village attachment and *In-situ* interaction of farmers, students and research station scientists	(6 credits)
In-situ interaction of farmers, college faculty and students	(in two splits)(2 credits)
Industrial Attachment*/Skill Development/Experiential Learning Courses	(8 credits)
Educational Tour	(2 credits)
Project Report Preparation and Evaluation	(Non Credit)

*****Industrial attachment shall include attachment with any of the following industries/Organisations

1. Seed industries/ companies
2. Fertilizer industries/companies
3. Pesticide industries/companies
4. Biotechnological industries/companies
5. Tissue culture laboratories
6. Bio-Pesticide industries
7. Commercial nurseries/land scaping units
8. Food processing units
9. Agricultural finance institutions/banks/credit societies, etc
10. NGOs

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