

Programme : - B.Sc.(Ag) Hons
For the students admitted w.e.f. the session 2008 – 09

Semester wise distribution of courses

I Semester

Course No.	Course Title	Credits
AGRON-4111	Introductory Agriculture and Principles of Agronomy	3(2+1)
PBG-4111	Principles of Genetics	3(2+1)
SCHEM-4111	Introduction to Soil Science	3(2+1)
EXTED-4111	Dimensions of Agricultural Extension	2(1+1)
PPATH-4111	Agricultural Microbiology	3(2+1)
COMP-4111	Introduction to Computer application	2(1+1)
MATHS-4111	Elementary mathematics	2(2+0)
ENG-4111	Comprehension and Communication Skills in English	3(2+1)
NSNC-4221	NCC/NSS	-
Total		21(14+7)

II Semester

AGRON-4121	Agricultural Meteorology	2(1+1)
PBG-4121	Principles of Plant Breeding	3(2+1)
PPATH-4121	Plant Pathogens and Principles of Plant Pathology	4(3+1)
ENTO-4121	Insect Morphology and Systematics	3(2+1)
AECON-4121	Principles of Agricultural Economics	2(2+0)
AENGG-4121	Fundamentals of Soil and Water Conservation Engineering 2(1+1)	
BIOCH-4121	Biochemistry	3(2+1)
SCHEM-4121	Soil Chemistry, Soil Fertility and Nutrient Management	2(1+1)
NSNC-4221	NCC/NSS	-
Total		21(14+7)

III Semester

AGRON-4211	Field crops-I (<i>Kharif</i>)	3(2+1)
AGRON-4212	Weed Management	2(1+1)
NEMAT-4211	Introductory Nematology	2(1+1)

STAT-4211	Statistics	3(2+1)
EXTED-4211	Fundamentals of Rural Sociology and Educational Psychology	2(2+0)
HORT-4211	Production Technology of Fruit and plantation Crops	3(2+1)
AECON-4211	Production Economics and Farm Management	2(1+1)
AENGG-4211	Farm power and machinery	2(1+1)
SCHEM-4211	Manures and Fertilizers	2(1+1)
NSNC-4221	NCC/NSS	-
Total		21(13+8)

IV Semester

AGRON-4221	Field crops-II (<i>Rabi</i>)	3(2+1)
AGRON-4222	Water management	2(1+1)
SCHEM-4221	Soil survey, land use planning and remote sensing	2(1+1)
ENTO-4221	Insect Ecology and Integrated pest management	3(2+1)
HORT-4221	Production Technology of Vegetables and Flowers	4(3+1)
AECON-4221	Agricultural Finance and Co-operation	2(1+1)
PPHYS-4221	Crop Physiology	3(2+1)
EXTED-4221	Entrepreneurship Development and Communication Skills	2(1+1)
NSNC-4221	NSS / NCC*	1(0+1)
Total		22(13+9)

* shall be offered from first to fourth semester and evaluation reported at the end of fourth semester.

V Semester

BT-4311	Principles of Plant Biotechnology	3(2+1)
AGRON-4311	Practical crop production I (kharif crops)	1(0+1)
ENTO-4311	Crop and stored grain pests and their management	4(3+1)
PBG-4311	Breeding of Field and Horticultural crops	3(2+1)
AECON-4311	Agricultural marketing, Trade and Prices	2(1+1)
AENGG-4311	Protected cultivation and Post harvest Technology	2(1+1)
PPATH-4311	Diseases of Field Crops and their management	3(2+1)
AGRON-4312	Rainfed Farming	2(1+1)
HORT-4311	Production technology of Spices, Aromatics and Medicinal crops	2(1+1)
Total		22(13+9)

VI Semester

AGRON-4321	Practical crop production II (Rabi crops)	1(0+1)
PBG-4321	Principles of Seed Technology	3(2+1)
EXTED-4321	Extension Methodologies for Transfer of Agricultural Technology	2(1+1)
LPM-4321	Livestock Production and Management	3(2+1)
ENVS-4321	Environmental Science**	3(2+1)
AGRON-4322	Farming Systems, Sustainable Agriculture and Organic farming	3(2+1)
HORT-4321	Post harvest management and value addition of fruits and vegetables	3(2+1)
PPATH-4321	Disease of Horticultural crops and their management	2(1+1)
AECON-4321	Fundamentals of Agri. Business Management	2(1+1)
Total		22(13+9)

** shall be shared between Biochemistry, Entomology and Soil Science

VII Semester

(Elective/ Experiential learning courses)

Group	Course No.	Course title	Credits
Crop	PBG-4411	Advanced Seed Technology	3(1+2)
Production	AGRON-4411	Applied Weed Management	3(1+2)
and	SCHEM-4411	Vermi-composting and Organic Farming	3(1+2)
Allied	SCHEM-4412	Soil , Plant and Water Analysis	3(1+2)
Disciplines	SCHEM-4413	Soil Management	3(1+2)
	AP-4411	Dairy Cattle Production	3(1+2)
	PPHYS-4411	Plant Growth Regulators in Agriculture	3(1+2)
	AENGG-4411	Plasticulture in Agriculture	3(1+2)
Plant	PBG-4411	Advanced Seed Technology	3(1+2)
Sciences	PBG-4412	Tissue Culture and Micro-propagation	3(1+2)
and Plant		Techniques	
Protection	PPATH-4411	Bio-agents and Integrated Disease Management	3(1+2)

Group	Course No.	Course title	Credits
	PPATH-4412	Detection and Management of seed borne Pathogens	3(1+2)
	ENTO-4411	Non-insect Pests and Their Management	3(1+2)
	ENTO-4412	Bio-control agents and Bio-pesticides	3(1+2)
	PPHYS-4411	Plant Growth Regulators in Agriculture	3(1+2)
	NEMAT-4411	Economic Nematology	3(1+2)
Horticulture and Allied Sciences	ENTO-4412	Bio-control agents and Bio-pesticides	3(1+2)
	SCHEM-4411	Vermi-composting and Organic Farming	3(1+2)
	PBG-4412	Tissue Culture and Micro-propagation Techniques	3(1+2)
	AENGG-4411	Plasticulture in Agriculture	3(1+2)
	HORT-4411	Nursery Management of Horticultural Crops	3(1+2)
	HORT-4412	Commercial Vegetable Production	3(1+2)
	HORT-4413	Commercial Fruit Production	3(1+2)
	PPHYS-4411	Plant Growth Regulators in Agriculture	3(1+2)
Social Sciences	AECON-4411	Marketing Management	3(2+1)
	AECON-4412	Project Formulation, Evaluation and Monitoring	3(1+2)
	AECON-4413	Natural Resource Economics and Management	3(2+1)
	EXTED-4411	Visuals and Graphic Communication	3(1+2)
	EXTED-4412	Government Policies and Programmes on Agriculture	3(1+2)
	STAT-4411	Sampling Techniques	3(1+2)
	AP-4411	Dairy Cattle Production	3(1+2)
	AP-4412	Poultry Production and Management	3(1+2)

Note- A student shall be required to offer six courses of 18 credits out of the eight listed in any one of the groups. The individual college will have an option to offer six course(s) out of the groups to be offered. The student can offer courses from a single group only for which he/she shall be required to submit preferences for these groups and no *inter-alia* group courses will be permitted.

VIII Semester

Rural Agricultural Work Experience (RAWE)	
Programme	Duration (Weeks) credits
• Orientation	1 (Non Credit)
• Research Station/KVK/ including village attachment and <i>In-situ</i> interaction of farmers, students and research station scientists	6 (6 credits)
• <i>In-situ</i> interaction of farmers, college faculty and students	2 (in two splits)(2 credits)
• Industrial Attachment*/Skill Development/Experiential Learning Courses	8 (8 credits)
• Educational Tour	2 (2 credits)
• Project Report Preparation and Evaluation	1 (Non Credit)

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

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/landscaping units
8. Food processing units
9. Agricultural finance institutions/banks/credit societies, etc.
10. Non-Governmental Organizations

Rural Agricultural Work Experience (RAWE)

18(0+18)

Grand Total (I to VIII Semester)

165(86+79)

B.Sc.(Ag) Hons Part I (I Semester)

AGRON -4111 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.

Suggested Readings:

- 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.
- 8 NCA (1976), Reports of the National Commission on Agriculture, Govt. of India, New Delhi.
 - Ojha, Madhusudan (1942), Kadambini (Sanskrit), Pub. Pradyumna Sarma Ojha, Jaipur.
 - 9 Parashara – Krishi Parashara (Agriculture by Parashara). Translated from Sanskrit to English by Nalini Sadhale (1999) with commentaries by H.V. Balkundi and Y.L. Nene. Asian Agri-History Foundation, Secunderabad, Bull No. 2, pp : 104.
 - 10 Rapala – Vrikshayurveda (The Science of Plant life). Translated from Sanskrit to English by Nalini Sadhale (1996) with commentaries by K.L. Mehra, S.M. Virmani and Y.L. Nene. Asian Agri-History Foundation, Secunderabad, Bull No. 1, pp : 104.
 - 11 Nene, Y.L. and Choudhary, S.L. 2002. agricultural Heritage in India. Asian Agri-History Foundation (AAHF), Secunderabad, Rajasthan Chapter of AAHF, Udaipur.
 - 12 Nene, Y.L. 2007. Glimpses of the Agricultural Heritage of India. Asian Agri- History Foundation, Secunderabad, Andhra Pradesh.
 - 13 Choudhary, S.L., Sharma, G.S. and Nene, Y.L. 2000. Ancient and Medieval History of Indian Agriculture. Rajasthan College of Agriculture, Udaipur, Rajasthan.

PBG -4111

Principles of Genetics

3 (2+1)

Theory:

History of Genetics. Ultra structure of cell. Cell organelles and their function. Chromosome structure, function and chemical composition – karyotype and ideogram. Cell division : types and their significance.

Mendel's laws of inheritance. Gene interaction and their types. Multiple alleles and some classical examples. Inheritance of quantitative and qualitative characters and differences 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 types, transcription, translation, genetic code and protein synthesis. Cytoplasmic inheritance – its characteristic features and difference between chromosomal and cytoplasmic inheritance. Structural chromosomal aberrations. Numerical chromosomal aberrations (polyploidy) and evolution of 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. Dihybrid ratio and its modification. Test of goodness of fit of genetic ratio. Study of different types of gene interactions and modifications of typical dihybrid F_2 ratios. Study and detection of linkage in F_2 and test cross progeny. Demonstration of structural aberrations and polyploidy.

Suggested Readings:

- 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, Muzaffarnagar (U.P.).
- 3 Klug, W.W. and Cummings, M.R. 2005. Concepts of genetics Pearson Education (Singapore) Pvt. Ltd., Indian Branch, Pratap Ganj, New Delhi
- 4 Singh, B.D. 2001. Fundamentals of Genetics, Kalyani Publishers, New Delhi.
- 5 Strickberger, M.W. 2001. Genetics. Prentice Hall of India Pvt. Ltd., New Delhi.

SCHEM- 4111

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.

Suggested Readings:

- 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, prentice 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 Milan 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 Agarwal, R.R., Yadav, J.S.P. & Gupta, R.N. (1982) Saline and alkali soils of India. ICAR, New Delhi.

EXTED-4111

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 Swarajgar 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.

Suggested Readings:

- 1 Dahama, 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, Bapatla.

P. PATH- 4111

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.

Suggested Readings:

- 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 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.

COMP-4111**Introduction to Computer Applications****2(1 + 1)****Theory:**

Unit I- 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.

Unit II- 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.

Unit III- 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.

Unit IV- 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.

Suggested Readings :

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

MATHS-4111

Elementary Mathematics

2(2+0)

Theory:

Functions and limits, continuity, differentiation of various types of functions; sum, product and quotient of functions, function of functions, parametric equations, successive differentiation, equations of tangent and normal, maxima and minima, methods of integration including integration by parts, definite integrals, application of definite integrals in finding areas under curves. Determinants, matrices, matrix addition and matrix multiplication, transpose of matrix, solution of linear equations using crammers rule.

Suggested Readings:

- 1 Krishi Ganita by Gokhroo and Jain
- 2 Differential calculus by Dr. D.C. Gokhroo
- 3 Integral calculus by Dr. D.C. Gokhroo

ENG-4111

Comprehensive and Communication Skills in English

3(2+1)

Theory:

Comprehension: Text for Comprehension: Current English for Colleges, by N.Krishnaswami & T. Sriraman (Macmillan India Limited, Madras, 1995).

Grammar & usage: Tenses, Active/Passive Voice, Reported Speech, Prepositions, Phrasal Verbs, Concord, Determiners

Vocabulary: Synonyms, antonyms, homonyms, homophones

Composition: (a) Letter and Application Writing: Personal/Business Correspondence, Preparation of Curriculum vitae and job applications

(b) Précis writing

Practical:

Phonetics (symbols) and transcriptions

Listening Comprehension: Listening to at least two tape recorded conversations aimed at testing and listening comprehension of students.

Spoken English practice by using Audiovisual aids ,oral presentation of reports, one presentation by individual on the given topics related to Agriculture like WTO , developing new technology in Agriculture, , Bio fertilizers etc.

Reading skills: using dictionary, rapid reading, intensive reading

Practice of Presentation by using Power Point and Data Projector

Group discussion and debates on current topics.

Suggested Readings:

- 1 Thomson and Martinet (1995) "A Practical English Grammar" OUP Publication

- 2 Thomson and Martinet (1997) "A Practical English Grammar, Exercise Books Vol. I & II" OUP Publication
- 3 Michal Swan(1995) "A Practical English Grammar" OUP Publication
- 4 David Green (1990) "Contemporary English Grammar Structure Composition" McMillan.
- 5 A.S. Hornby (1997) "Advance Learner's Dictionary" OUP Publication
- 6 Krishnamohan " Speaking English Effectively" McMillan
- 7 Work Book of Indira Gandhi National Open University, Delhi. (Course No. Feg.1,Feg.2 and Feg.3)
- 8 Audiovisual tapes prepared by British Council, New Delhi and CIEFL, Hyderabad
9. S. Allen (1997) "Living English Structure" Orient Longman
10. Daniel Jones (1997) "Drills and Tests in English Sounds" ELBS

NSNC-4221 NCC/NSS/Physical Education 1(0+1)

NSS: Orientation of students in national problems, study of philosophy of NSS, fundamentals 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 programmes, 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. Introduction and 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, hygiene and sanitation, civil defence, leadership and NCC song.

Physical Education: Introduction to physical education. Posture, exercise for good posture, physical fitness exercises for agility, strength, coordination, endurance and speed. Rules 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 tennis. Rules and regulations of athletic events, participation in any one of the athletic events, long jump, high jump, triple jump, javelin throw, discuss throw, shot put, short and long distance running, Safety education, movement education, effective way of doing day-to-day activities. First-aid training, coaching for major games and indoor games. Asans and indigenious ways for physical fitness and curative exercises. Exercises and games for leisure time, use and experience.

Note: Warming up and conditioning exercises are compulsory before the commencement of each class.

B.Sc. (Ag) Hons Part I (II Semester)

AGRON- 4121 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-meteorological 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.

Suggested Readings:

- 1 Sacheti, A.K. 1985. Agricultural Meteorological Instructional Cum Practical Manual (E.d.) 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

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 apomixis), 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 plants- variety, inbred line, different hybrids, synthetic, composite, multiline, clone, etc. Different breeding methods of their development. Polyploidy in relation to plant breeding. Mutation breeding- types, role and method of mutation breeding. Use of biotechnology in plant breeding. Procedure for release of new varieties.

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.

Suggested Readings:

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

Theory:

Introduction, Important plant pathogenic organisms, different groups, fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, 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 Forecasting - 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*, *Hemilia*; 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.

Suggested Readings:

- 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 Eastern Private Limited, New York
- 3 Mehrotra, R.S. and Aggarwal, 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.

ENTO-4121 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- Octuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Coleoptera- Coccinellidae, Galerucidae, Cerambycidae, Curculionidae, Bruchidae, Melonhidae, Hymenoptera- Tenthredinidae, 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.

Suggested Readings:

- 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.
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.

AECON-4121 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

Suggested Readings:

- 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

AENGG -4121 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 and permanent 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.

Suggested Readings:

1. Murthy V.V.N. 1982 Land and Water Management Engineering. Kalyani Publishers, New Delhi.
2. Michael A.M. 1989. Irrigation: Theory and Practices. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Michael A.M. and T.P. Ojha. 1993. Principles of Agricultural. Engineering. Vol. II. Jain Brothers, New Delhi.

BIOCH -4121 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.

Suggested Readings:

1. Conn EE, Stumpf PK, Bruining G and Doi RH (2007). Outlines of Biochemistry. JohnWiley and Sons, New York.
2. Lehninger AL (2004). Principles of Biochemistry, Freeman and Company, USA
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

SCHEM-4121 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 calcareous 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.

Suggested Readings:

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 Dhyani, 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 (5th 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)

B.Sc. (Ag) Hons Part II (I Semester)

AGRON-4211

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*, *Lasiurus* 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.

Suggested Readings:

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 Chhattachopadhyay, S.B. 1988. Handbook of Annual Oil Seed Crops. Oxford & IBH Publishing Co., New Delhi.
6. Jaiswami, L.H. and Baldeo, B. 1990. Advances in Pulse 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 pramukh fasle. G.B. Pant Agricultural & Technology University, Nainital.
12. Reddy, S.R. 2004. Agronomy of Field Crops. Kalyani Publishers, New- Delhi.

AGRON- 4212 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).

Suggested Readings:

- 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.

NEMAT-4211 Introductory Nematology

2(1 + 1)

Theory:

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 necessities, 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.

Suggested Readings:

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. Midha R.L. and Sharma G.L. (2007) Laboratory Manual of Elementary Nematology, SKRAU, Bikaner
4. M. K. Singh (1982) in the field of nematology; vdkneh] t; i j A
5. M. K. Singh (1982) in the field of nematology; vdkneh] t; i j A

Theory:

Introduction: Definition of statistics by Seligman and Horace 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. Chi-square test for Goodness of fit and testing 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. Chi-square test for Goodness of fit & test of independence in 2x2 contingency table and m x n contingency table.

Suggested Readings:

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.

EXTED-4211 Fundamentals of Rural Sociology and Educational Psychology 2(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.

Suggested Readings :

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. Dahama, 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.) –313001.

HORT—4211 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.

Suggested Readings:

1. Bose.T.K., Kabir.J., Das.P and Joy.PP.(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. andRathore.D.S.(1991) Temperate Fruits. Horticulture & Allied 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

AECON- 4211 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.

Suggested Readings:

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 Agricultural 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".

AENGG -4211**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 numericals. 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 and its safely; Hitching of implements; Numericals 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 numericals).

Practical :

Identification of engine parts; Study of air and fuel supply system; Study of lubricating and cooling system; Study of transmission system; Tractor driving and its safety; Hitching of implements; 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 ferti-seed drill; Estimation of tractor operational cost; Numerical problems on field capacity, field efficiency and power requirement of implements; and numericals on engine terminology.

Suggested Readings:

1. Michael, A.M. and Ojha, T.P. . 1987. Principles of Agricultural Engineering. Vol. I. Jain Brothers, Jodhpur.
2. Rai and Jain. 1989. Farm Tractors, Maintenance and Repair. Tata Mc Graw Hill Publ. New Delhi.
3. Srivastava, A.C. 1989. Elements of Farm Machinery. Oxford IBH Publ. Company, New Delhi.

4. Singhal, O.P. 1989. Elements of Agricultural Engineering, Vol. I & III. Suraj Prakashan, Allahabad.
5. Sahay, Jagdishwar. 1990. Element of Agricultural Engineering. Agro. Book Agency, New Chitragupta Nagar, Patna.

SCHEM-4211

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, Vermicomposting, 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 P_2O_5 , potassium, calcium, sulphur and zinc contents of fertilizers, Adulteration in fertilizer.

Suggested Readings:

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.

B.Sc. (Ag) Hons Part II (II Semester)

AGRON-4221

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, inter-cultural 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 seeds 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.

Suggested Readings:

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 Oil Seed Crops. Oxford & IBH Publishing Co., New Delhi.
6. Jaiswami, L.H. and Baldeo, B. 1990. Advances in Pulse 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 Pramukh Phaslen. G.B. Pant Agricultural & Technology University, Nanital.
12. Reddy, S.R. 2004. Agronomy of Field Crops. Kalyani Publishers, New-Delhi.

AGRON- 4222 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, pearl millet, 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).

Suggested Readings:

1. Michael, A.M. 1987. Irrigation - Theory and Practice, Vikas Publishing House Pvt. Ltd., New-Delhi.
2. Parihar, S.S. and Sandhu, B.S. 1978. Irrigation of Field Crops- Principles and Practices, ICAR, New-Delhi.
3. Lenka, D. 1999. Irrigation and Drainage . Kalyani Publishers, New-Delhi.
4. Sankara Reddy, G.H. and Yellamanda Reddi, T. 1995. Efficient use of Irrigation Water . Kalyani Publishers, New-Delhi.
5. Reddy,S.R. 2000. Principles of Crop Production , Kalyani Publishers, New-Delhi.
6. Majumdar, D.K. 2004. Irrigation Water Management- Principles and Practice. Prentice Hall of India , New-Delhi.

7. Mishra, R.D. and Ahmed, M. 1987. Manual on Irrigation Agronomy, Oxford & IBH Publishing Co.Pvt..Ltd., New-Delhi.

SCHEM- 4221 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 imagery, 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.

Suggested Readings:

1. Brady, N.C. (1996) The nature and properties of soil Mac Millan, Publishing company New York.
2. Buol, S.W., Hole, H.D. and Mc Crackoh, R.J. (1980) Soil genesis and classification, Oxford and IBH publishing Co. New Delhi.
3. Cursau Paul, J. (1985) Principal of remote sensing, Loymen, New York.
4. Illes, T.m. and Kiefer, R.W. (1979) Remote sensing and image interpretation John willey and sons, New York.
5. Patel, A.N. and Singh Surendra (1999) Principal of remote sensing, Scientific publishers (India) Jodhpur.
6. Sehgal, J. (2000) Pedology: Concepts and applications, Kalyani publisher, Ludhiana
7. ISSS (2002) Fundamental of Soil Science Div. of Soil Science, IARI, New Delhi

**ENTO— 4221 Insect Ecology and Integrated Pest Management
Including Beneficial 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.

Suggested Readings:

- 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.

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.

Suggested Readings:

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. Bosse, 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

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, Maharashtra. 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.

Suggested Readings:

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"
7. Nelson, A.G. and Murray, W.G. 1988 "Agricultural Finance" IOWA State University Press, Ames, IOWA, USA

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 C_3 , C_4 and CAM plants, Factors affecting WUE. Photosynthesis, Energy synthesis, Significance of C_3 , C_4 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, Deficiency and toxicity 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.

Suggested Readings:

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

EXTED-4221 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 lab record; indexing, footnote and bibliographic procedures. Summarizing, abstracting; individual and group presentation. Practice on SWOT Analysis, visit to SMEs / SSIs

Suggested Readings:

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. Entrepreneurship 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. De, Dipak and Rao, M.S. Entrepreneurial behaviour of farmers : An axiomatic theory., Ganga Kaveri Publishing House, Varanasi.
8. De, Dipak and Jirli, Basavaprabhu . Entrepreneurship : Theory and practice in agriculture., Ganga Kaveri Publishing House, Varanasi.

B.Sc. (Ag) Hons Part III (I Semester)

BT-4311

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.

Suggested Readings:

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. Purohit, S.S.1997, Biotechnology, Agrobotanical Publication Bikaner
4. Rajdan, M.K.1996, An introduction to plant tissue culture, Oxford and IBH Pub. Co. 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.
7. Singh, B.D. 2001. Biotechnology, Kalyani Publishers, Ludhiana.

AGRON- 4311

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.

Suggested Readings:

1. Yawalkar, K.S. Agarwal J.P. and Bokde S., 1992, Manures and Fertilizers. Agri-Horticultural Pub. House, Nagpur – India.
2. Balasubramaniam, 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

ENTO- 4311 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, pearl millet, 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, pearl millet, 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.

Suggested Readings:

- 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, New Delhi.
- 6 Khare, B.P. 1994. Stored Grain Pests and Their Management, Kalyani Publishers, New Delhi

PBG 4311 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, pearl millet, 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).

Suggested Readings:

1. Chaddha, K.L. and Rajendra Gupta. 1995. Advances in Horticulture Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.
2. Chopra, V.L. 2000. Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Mandal, A.K., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding Vol. I and II. CBS Publishers and Distributors, New Delhi.
4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenti-First Century (Edt). Internatinal 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.

9. Agrawal, S., E V Divakara Sastry, R.K.Shrma. 2002. Seed Spices- production, quality and export. Avishkar Publishers, Jaipur.

AECON- 4311

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.

Suggested Readings:

1. Acharya, S.S. and Agarwal, N.L. 1987. Agricultural Marketing in India, Oxford & IBH, New Delhi
2. Moore, J.R. , Johl, S.S. and Khusro A.M. 1973. Indian Food Grain Marketing, Printice Hall, New Delhi
3. Kahlon, A.S. and Tyagi, D.S. 1983. Agricultural Price Policy in India, Allied Publishers, New Delhi
4. Bhall, V.K. and Shiva Ramu, S. 1996 International Business-Environment and Management, Anmol Publications (P) Limited, New Delhi

AENGG -4311

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.

Suggested Readings:

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

PPATH-4311 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 smut 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.

Suggested Readings:

- 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 (2nd.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 ND.
- 6 Singh R S .2007 Plant Diseases.(8th.ed) Oxford and IBH Publishing Co.Pvt .Ltd .ND

AGRON- 4312

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 runoff plots and soil /nutrient losses.

Suggested Readings:

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.

HORT- 4311 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.

Suggested Readings:

1. Sharma, R. (2004). Agro. Techniques 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.

B.Sc. (Ag) Hons Part III (II Semester)

AGRON- 4321 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

Suggested Readings:

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.

AGRON—4322 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.

Suggested Readings:

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 Botanica, 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, Publishing Academy, Udaipur.
12. Gautam, R.C. and Singh, Punjab 1997. Tikau Kheti, Bhartiya Krishi Anusandhan Parishad, New-Delhi.
13. Sharma, Arun, K. 2005. Jevik Kheti- Sidhant, Taknik and Upyogita. Agrobios, Jodhpur.

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 for certified, foundation and breeder seed production. Deterioration of crop varieties, factors affecting deterioration and their control; Maintenance of genetic purity during seed production. Steps involved in development of seed programme and seed multiplication. Production of nucleus & 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, tomato and hybrids; chillies and cucurbits (varieties and hybrids): Seed production of wheat, barley, gram and rapeseed mustard. Seed certification, phases of certification, procedure for seed certification and field inspection, field 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 penalties. Seed control order : Seed Control Order 1983. Intellectual Property 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 working principle, different upgrading equipment and their use. Principles of seed treatment Seed storage; stages of seed storage, factors affecting seed longevity during 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 test Germination analysis and viability test of Field and Horticultural crops; Vigour tests of Field and Horticultural crops; KOH and NaOH test for varietal identification; Visit of GOT fields at University farms. Visit to Seed production plots of University Farms. Visit to Seed processing plant; Seed testing laboratories; Varietal identification in seed production plots; Planting ratios, Minimum seed certification standards of important crops in the vicinity.

Suggested Readings:

1. Agarwal, R.L. 1991. Seed Technology, Oxford & IBH Publishing Co. Delhi.
2. Agarwal, P.K. 1999. Seed Technology, ICAR, New Delhi.
3. Subir Sen and Nabinanda Ghosh. 1999. Seed Science and Technology. Kalyani Publishers.
4. Dhiredra Khare and Mohan S. Bhale. 2000. Seed Technology. Scientific Publishers (India), Jodhpur.

5. Maloo, S.R., Intodia, S.K. and Pratap Singh. 2008. Beej Pradyogiki. Agrotech Publishing Academy.
6. A.K. Joshi and B.D. Singh. 2005. Seed Technology. Kalyani Publishers. New Delhi.

EXTED-4321 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.

Suggested Readings:

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, Bapala.

LPM-4321 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.

Suggested Readings:

1. Banerjee, G. C. 2003. A Text Book of Animal Husbandry. VIII ed. Oxford and IBH Publications. New Delhi.
2. ICAR. 2000. Hand Book of Animal Husbandry published by DIPA, ICAR, New Delhi.
3. Ranjan, SK.1994 Animal Nutrition and Feeding Practices. Vikash Publications. New Delhi.
4. Sukumar,De. 2000. Outlines of dairy technology. Oxford University Press, New Delhi.
5. Thomas C.K., Sastry NSR and Singh, RA.1982. Farm Animal Management and Poultry Production. Vikash Publications. New Delhi.

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. ***

Bio chemistry ** Entomology * Soil science*

Suggested Readings:

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. Nemerom, 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, Wisconsin, 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.

HORT- 4321

**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 deterioration 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.

Suggested Readings:

1. Srivastava, R. Pand Kumar, S. (2007). Fruits and Vegetyable 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

PPATH- 4321 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.

Note: Student should submit at least 25 pressed well mounted disease specimen.

Suggested Readings:

- 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(2nd.ed.) Tata McGraw-Hill Publishing Co Ltd., New Delhi.
- 3 Pathak, V.N. 1980. Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd, . New Delhi.
- 4 Godara, S.L., Kapoor, B.B.S. and Rathore B.S. 2010. Disease Management of Spice Crops. Madhu Publications. Bikaner (Raj.).
- 5 Rangaswamy, G. and Mahadevan, A .2001. Diseases of crop plants in India. Prentice Hall of India Pvt Ltd., New Delhi.
- 6 Singh, R.S. 2006. Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- 7 Singh, R.S. 1994. Diseases of vegetable crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- 8 Singh, R.S. 2007. Plant Diseases. (8th.ed) Oxford and IBH Publishing Co. Pvt . Ltd. New Delhi.

AECON-4321 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, Policies, 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.

Suggested Readings:

1. Mamoria, C. B. and Joshi. Principles and practice of Marketing in India.
2. Subba Reddy, S. and Raghu Ram, P. Agricultural finance and Management.
3. Kohls, R.I. and Uhj, J.N. 2005. Marketing of Agricultural Products. 9th ed. Prentice Hall
4. Kotler. Marketing Management.

B.Sc. (Ag) Hons Part IV (I Semester)

AGRON- 4411

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 quantitative analysis of weedy vegetation; Bioassay for herbicide residue estimation; Control of *Parthenium hysterophorous*; Visits to observe weed problems on farmers fields and aquatic ecosystem.

Suggested Readings:

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.

AENGG-4411

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 grain 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.

Suggested Readings:

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, Ministry of Agri., Govt. of India.
4. Pandey P.H. 1998. Principles and Practices of Post Harvest Technology. Kalyani Publishers, New Delhi.

ENTO- 4411

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. Burrow patterns and feeding habits of 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.

Suggested Readings:

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.

ENTO - 4412

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.

Suggested Readings:

- 1 DeBach, P. 1974. Biological control by Natural enemies. Cambridge University Press. Manfred Mackaur,
- 2 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. Kalyani Publ., New Delhi.
- 6 Dhaliwal, GS & Koul O. 2007. Biopesticides and Pest Management. Kalyani Publ., New Delhi.
- 7 Gautam, R.D. Biological Pest Suppression, Westvill Publishing Co., New Delhi.

EXTED-4411

Visuals and 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.

Practicals :

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.

Suggested Readings:

1. Bhatia A. 2005. Visual Communication. Rajat Publications, New Delhi.
2. Edgar Dale 1970. Audio Visual methods in Teaching. Holt, Rinehart & Winston.
3. James WB, Richard BL, Fried F Harcleroad. 1952. A.V. Instructional Material & Methods. Mc.Graw Hill.
4. Reddy YN. 1998. Audio Visual Aids in Teaching, Training and Extension. Haritha Publ. House, Hyderabad.

EXTED-4412 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.

Suggested Readings:

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. Mecomillan 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.

HORT- 4411 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.

Suggested Readings:

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.

HORT-4412 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, commercial

varieties, nutritional requirement, irrigation, intercultural-operations, weed control, mulching, plant protection of important commercial vegetables, solanaceous, Okra, bulb crops, cucurbits, cowpea, amaranthus & cluster bean. 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 germination 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 & Turnip for seed production. Preparation of cropping scheme for commercial vegetable grower/farms. Preparation of Nursery beds, seed treatment and sowing of seeds in beds. Sowing of seeds in polythene bags/pro-trays. Pro-trays seedling preparation & 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-fertilizers, liquid fertilizers & nutrient spray in vegetable crops. Inter cultural operations in Vegetable crops. Spray of pesticides, fungicides & use of PGRs. Study of Physiological disorders in Vegetables. Study of maturity standards & harvesting. Seed extraction techniques.. Pre cooling, washing, grading, packaging & storage of vegetable crops. Calculation of cost of production and B/C ratio. Identification of Major Pests, Diseases & Disorders. Study of storage techniques of vegetable crops.

Suggested Readings:

1. Chadha, K.L. & Ka1oo, G. advances in Horticulture. Vol.5 & 6. Vegetable Crops; Malhotra Publishing House, New Delhi.
2. Chaudhary, B. 1996. Vegetables, NBT, New Delhi
3. Bose, T.K., Kabir, 1., Maity, T.K., Parthasarthy, V.A. & Sons, M.G. 2006, Vegetable Crops. Vol.I,II & III (IIIrd revised edition).
4. Singh, S.P. 1989. Production technology of Vegetable crops. Agril. Research, Communication Centre, Karnal.

HORT. 4413

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.

Suggested Readings:

- 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.

PPATH- 4411**Bioagents 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 biopesticide production units.

Suggested Readings:

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. Biotechnological Approaches for the Integrated Management of Crop Diseases. Daya Publ. House, New Delhi.
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.

PPATH- 4412 Detection and Management of Seed-Borne Pathogens 3(1+2)

Theory:

Importance of seed-borne diseases. A brief account of seed-borne fungal, bacterial and viral diseases. Harmful effects of storage fungi. Effect of growth stage and weather conditions on seed transmission. Paths of infection – ovule, embryo, endosperm, seed-coat and pericarp infection, seed contamination. Seed health testing methods. Management of seed-borne diseases- 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. Detection of seed-borne pathogens by blotter method.. Detection of seed-borne pathogens by agar plate method. Seedling symptom tests. Embryo count method. Molecular techniques for detection of seed borne pathogens (ELISA and PCR). Identification of common seed-borne fungi Alternaria, Colletotrichum, Drechslera, Fusarium etc under microscope. Effect of chemical and biological seed treatment on seed-borne pathogens. Inspections of seed crops in field.

Suggested Readings:

1. Agarwal V.K and J.B. Sinclair. 1993. Principles of Seed Pathology, Vol I& II, CRC Press. Inc. Boca Raton, Florida.
2. Hutchins, J.D. and Reeves, J.F. (Eds.). 1997. Seed Testing Progress towards the 21st Century. CABI, Wellington.
3. Jha, D.K. 1993. A Text Book on Seed Pathology. Vikash Publishing House Pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi.
4. Jha, D.K. 1995. Laboratory Manual on Seed Pathology. Vikash Publishing House Pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi.
5. Maude, R.B. 1996. Seed-borne Diseases and Their Control. CAB International, U.K.
6. Neergaard, P. 1988. Seed Pathology, Vol. I & II Macmillan Press, U.K.
7. Suryanarayana, D. 1978. Seed Pathology. Vikash Publishing House Pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi.
8. Vishunavat, K. 2007. Seed Health Testing- Principles and Protocols. Kalyani Publs., 24, Daryanganj, New Delhi.

PBG- 4411**Advanced Seed Technology****3(1+2)****Theory:**

Objectives : to make the candidate self reliant in production of hybrid seed and conversant with the seed technology.

Heterosis : 1.Inbred line production and maintenance. (a) Production of inbreds by various methods (b) Evaluation of inbreds. (c) Maintenance of inbreds. 2.Production of hybrids. (a) Emasculation techniques (b) Use of male sterility (c) Use of self incompatibility (d) Maintenance of MS lines. 3.Production of composites and synthetics. 4.Exploitation of apomixis. 5.Visit to seed production units

Seed technology : 1.Setting up of Seed testing laboratory . 2.Different tests of seed quality for seed legislation.3. Awareness of seed processing equipment. 4.Setting up of seed processing unit. 5.Visit

to different seed processing units Seed marketing: 1. Setting up of marketing units (a). Economics of seed production (b) Supply chain management (c) Storage and packaging. 2. Obtaining Licenses for seed production and processing units. 3. Private and public seed production systems. Risk factor analysis in seed business. 4. 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

Suggested Readings:

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

PBG -4412 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:

Setting up of commercial micropropagation unit. 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.

Suggested Readings:

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 principles, Techniques and Applications, MJP Publishers, Chennai
5. Mascarenhas, A. F. (2008) Hand book of Plant tissue Culture, ICAR. N. Delhi.

SCHEM- 4411 Vermicompost and Organic Farming

3 (1+2)

Theory:

Vermicompost- Definition and objectives of vermiculture. 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, trees 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 procurement of 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.

Suggested Readings:

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 usage). 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.

SCHEM – 4412 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 (CO_3^{--} and HCO_3^{-}) 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 (CO_3^{--} , HCO_3^{-} , Cl^{-}) in irrigation water and.Computation of S A R and R S C .

Suggested Readings:

1. Chopra, S.L. and Kanwar, J.S. 1999. Analytical Agriculture Chemistry, Kalyani Publisher, Lucknow.
2. Biswas, T.D. and Mukherjee, S.K. 1995. Text book of Soil Science (2nd Ed.) Tata Graw Hill Publishing Company Limited, New Delhi.
3. Jackson, M.L. 1973. Soil Chemical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi.
4. Tandon, H.L.S. 1990. Methods of Analysis of soil, plant, water and fertilizers, FDCO, New Delhi.
5. Tisdale, W.L., 68 Nelson and Beaton, J.D. 1990. Soil Fertility and Fertilizers Macmillan Publishing Company, New York
6. Gupta, P. K. 1999-2000. Soil, Plant, Water and Fertilizer Analysis, AgroBotanica, Bikaner.
7. Richards, L.A. (1954). Diagnosis and improvement of saline and alkali soils. USDA Hand book No. 60, Washington, DC USA.

Theory:

Soil resources of India; distribution of wasteland and problematic soils with special reference to Rajasthan; soil tillage 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 CaCO₃ 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.

Suggested Readings :

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

STAT-4411 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.

Practicals :

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 ,tape 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.

Suggested Readings:

1. Cochran, W.G. 1977. Sampling Techniques, John Wiley.
2. Murthv, M.N. 1977. Sampling Theory and Methods. 2nd Ed, statistical Publ.
3. Singh, D. Singh, P. and Kumar, P. 1982. Handbook on Sampling Methods, IASRI Pub I.
4. Sul:hatme. I'.V.; Sul:hatme. I3.V.; Sulalatme, S. and Ashok. C. 1984. Sampling Theory of Surveys with Applications. Iowa State university Press and Indian Society of Agricultural Statistics. New Delhi.

AP- 4411 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.

Suggested Readings:

1. Banerjee, G. C. 2003. A Text Book of Animal Husbandry. VIII ed. Oxford and IBH Publications. New Delhi.
2. ICAR. 2000. 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 Production. 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.

AP-4412 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.

Suggested Readings:

1. Banerjee, G. C. 2003. A Text Book of Animal Husbandry. VIII ed. Oxford and IBH Publications. New Delhi.
2. ICAR. 2000. 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 Production. 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.

NEMAT-4411

Economic Nematology

3 (1+2)

Theory:

Objectives - To impart the basic and practical knowledge related with economic importance of Nematodes in field and horticultural crops. Historical perspectives, Economic importance and symptoms of nematode diseases in plants, Nematode diseases of field crops: Cereals- Ear cockle and yellow ear rot diseases of wheat, Molya disease of Wheat and Barley, Maize cyst nematode disease; Nematode diseases of vegetables (Root-knot, Reniform diseases of tomato, brinjal, Potato, Cauliflower, Chillies, peas, okra, cucurbits, fruits (Root-knot nematode, citrus . Nematode and reniform nematodes of Papaya, Banana and Citrus etc); Phytonematode management in field / horticultural crops-including economic management strategies viz .cultural, physical, chemical, biological, breeding for disease management and Integrated nematode management, etc.

Practical:

Diagnosis of economic important diseases in the state; Survey and surveillance and collection of soil and plant samples from nematode infested fields of various crops; Extraction of nematodes from soil and plant samples; Preparations of semipermanent mount of nematodes from nematode suspension; Identification of various stages of semi-endo and endo parasitic nematodes of economic importance; Study of pathogenic level of phytonematodes in crops; Study of apparatus/equipments used during the chemical control strategy ; Calculation of recommended doses of nematicides /bio- agents.

Suggested Readings:

1. Bhatti, D.S. and Walla, R.K. 1992. Nematode pests of crops. C. B. S. Publication, N. Delhi.
2. Hussain, S.I. and Khan, T.A. 1988. Nematode diseases of plants. Cosmo Publ. N. Delhi.

3. Swarup, G. and Dasgupta, D.R. 1986. Plant Parasitic Nematodes of India: Problem and Progress, IARI, New Delhi-110012.
4. Sharma, G. L. 2009. Phytonematode Management in Field Crops. Oxford Book Co. Jaipur.
5. Parvathareddy, P. 1987. A treatise on Phytonematology. Agricole Publishing Academy, New Delhi.

PPHYS- 4411 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 precaution. 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. Visit to orchards for demonstration of flower and fruit drop and their control measures

Suggested Readings:

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

AECON-4411

Marketing Management

3(2 + 1)

Theory:

Marketing Management : Meaning, definitions, marketing, Mix, market segmentation, targeting & positioning, market information system, market organization 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.

Suggested Readings:

1. Ramaswamy, V.S. , Namakumari, S. 2006. Marketing Management. 3rd ed. Macmillian publishers India Ltd.
2. Kotler P. 2002. Marketing Management - Analysis planning, implementation and control, Pearson Edu.
3. Saxena, R. 2002. Marketing Management : Mc GrawHill
4. Stanton W.J. Etzel MJ & Walker B.J. 1996. Fundamentals of Marketing . Mc GrawHill
5. Acharya, S.S. and Agarwal, N.L. 2004. Agril. Marketing in India. 4th ed. Oxford & IBH Publishing Co.

AECON-4412 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, pay back 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

Suggested Readings:

1. Subba Reddy, S. and Raghu Ram, P . Agriculture Finance and Management.
2. Chandra, P. 2005. Project management. Tata Mc GrawHill
3. Gopal Krishan & Nagarajan K. 2005. Project Management. New Age.
4. Gittinger J.P. Economic analysis of Agricultural Project. The Johns Hopkins Univ. Press
5. Ramamoorthy, V.E. 2005. Text Book of Project Management, Mc Millan.

AECON-4413 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.

Suggested Readings:

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

B.Sc. (Ag) Hons Part IV (II Semester)

Rural Agricultural Work Experience (RAWE)

18(0+18)

Programme	Duration (Weeks) credits
• Orientation	1 (Non Credit)
• Research Station/KVK/ including village attachment and <i>In-situ</i> interaction of farmers, students and research station scientists	6 (6 credits)
• <i>In-situ</i> interaction of farmers, college faculty and students	2 (in two splits)(2 credits)
• Industrial Attachment*/Skill Development/ Experiential Learning Courses	8 (8 credits)
• Educational Tour	2 (2 credits)
• Project Report Preparation and Evaluation	1 (Non Credit)

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

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/landscaping units
8. Food processing units
9. Agricultural finance institutions/banks/credit societies etc.
10. Non-Governmental Organizations