

ADOPTION OF 4th DEANS COMMITTEE RECOMMENDATION IN IGKV, RAIPUR w. e .f. ACADEMIC SESSION 2008-09 (EMR- 30th July 2008 , 69th BOM 4th August 2008 and 62nd ACM- 12th September 2008)

DISTRIBUTION OF COURSES FOR B.Sc. (Ag.)

THIRD YEAR

1st Semester

1.	AGRO 311	Weed Management	2	1	1
2.	AGRO 312	Practical Crop Production – I	1	0	1
3.	AGRO 313	Rainfed Agriculture	2	2	0
4.	AHORT 311	Post Harvest Technology	2	1	1
5.	AEC 311	Farm-Business Management and Project Appraisal	2	1	1
6.	AENT 311	Crop Pests and Management – I	2	1	1
7.	APB 311	Principles of Seed Technology	3	2	1
8.	APP 311	Introductory Nematology	2	1	1
9.	AENGG 311	Farm Power, Machinery & Renewable Energy	3	2	1
10.	AFS 311	Pisciculture	2	1	1
11.	ALWM 311	Disaster Management	2	1	1
			23	13	10

2nd Semester

1.	AGRO 321	Farming System and Sustainable Agriculture	2	1	1
2.	AGRO 322	Organic Farming	2	1	1
3.	AMB 321	Agricultural Microbiology	2	1	1
4.	AEC 321	Production Economics and Farm Management	2	1	1
5.	AENGG 321	Protected Cultivation and Post Harvest Technology	2	1	1
6.	AFOR 321	Environmental and Forestry Science	3	2	1
7.	AENT 321	Crop Pests and Management – II	2	1	1
8.	AEXT 321	Extension Methodologies for Transfer of Technology	2	1	1
9.	ASOIL 321	Manures, Fertilizer and Agrochemicals	3	2	1
10.	ABT 321	Principle of Biotechnology	2	1	1
			22	12	10

COURSE TITLE	:	WEED MANAGEMENT
COURSE No	:	AGRO-311
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	3 rd YEAR / 1 st SEMESTER

Theory:

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination; Weed biology and ecology, crop weed association, crop weed competition and allelopathy (crop weed interference). 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; herbicide absorption, movement/translocation in soil and plants. Mode of action and mechanism of action of herbicides- definition and differences. Introduction to selectivity of herbicides; Compatibility of herbicides with other agro chemicals; Weed management in major field and horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control. Indices of weeds and weed management.

Practical:

1. Identification of weeds and preparation of weed herbarium.
2. Survey of weeds in crop fields and other habitats.
3. Calculations on weed control efficiency, weed index and economics of weed control practices
4. Herbicide label information and computation of herbicide doses.
5. Study of herbicide application equipment and calibration.
6. Practical on integrated weed management practices- manual, mechanical and chemical in selected crops.
7. Preparation of list of commonly available herbicides.
8. Study of phytotoxicity symptoms of herbicides in different crops.
9. Biology of nut sedge, bermuda grass, parthenium, melilotus and echinochloa .
10. Tours and visits of problem areas.

Reference:

1. Manual of weed control: N.C. Joshi.
2. Weed control as a science: G.C. Klingman.
3. Principles of weed science: V.S. Rao
4. Weed control: A.S. Crafts and W.W. Robbins.
5. Modern weed science: O.P. Gupta

COURSE TITLE : PRACTICAL CROP PRODUCTION - I
COURSE No : AGRO-312
CREDIT HOURS : 1 (0+1)
YEAR/SEMESTER : 3rd YEAR / 1st SEMESTER

Practical:

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

References:

1. Bharat ki Fasle – Chhidda Singh and Om Prakash.
2. Bharat ki Pramukh Fasle – Kalicharan Sharma.
3. Kharif and Rabi ki Fasle – Om Prakash.
4. Sasya Vigyan – Jagannath Singh.
5. Hand Book of Agriculture: ICAR.
6. Scientific crop production: C. Thakur.
7. Field Crops: Y.M. Iyer.
8. Cereal Crops: W.H. Leonard and J.H. Martin.

COURSE TITLE	:	RAINFED AGRICULTURE
COURSE NO	:	AGRO-313
CREDIT HOURS	:	2 (2+0)
YEAR/SEMESTER	:	3 rd YEAR / 1 st SEMESTER

Theory:

Rainfed farming : Definition, importance and Characteristics.

Dry farming : Definition, importance and extent. Factors affecting crop production under rainfed and dry farming areas – Climatic factor, Soil Factors, Plant factors and management factors.

Management of rainfed and dryland farming – Water management, Soil management, Crop management, Efficient crop and varieties for the region, Organic and bio fertilizer management and Social management. Important cropping system.

Technology for dryland farming – Agronomical methods of water conservation, Tillage, Mulching, contouring, Trenching and pitting, Terracing, Waterways, Farm ponds

Crop planning based on storage moisture capacity of the soils and moisture availability period land use capability classification.

Moisture conservation practices to increase infiltration and reduce water losses and runoff, Runoff collection and its effective utilization for crops and cropping systems. Contingent plans for aberrant weather conditions, moisture stress, drought, excess moisture etc.

Reference :

1. Hand book of Agriculture – ICAR
2. Soil Erosion and Conservation – By R.P. Tripathi and H.P. Singh.
3. Soil Conservation in India- Rama Rao.
4. Principals of Agronomy- Raddy and Raddy
5. Principals of Agronomy- S.R.Raddy
6. Dryland Farming – Arupratan Ghosh & P.K.Jana
7. Principals and practices of dryland Agriculture – K. Govindan & V. Thirumurugan

COURSE TITLE	:	POST HARVEST TECHNOLOGY
COURSE No	:	AHORT-311
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	3 rd YEAR / 1 st SEMESTER

Theory:

Importance of post harvest technology in horticultural crops. Maturity indices, harvesting and post harvest handling of fruits and vegetables. Maturity 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. Methods of storage – precooling, prestorage treatments, low temperature storage, controlled atmospheric storage, hypobaric storage, irradiation and low cost storage structures. Various methods of packing, packaging materials and transport. Packing technology for export. Fabrication of types of containers, cushioning material, vacuum packing, poly shrink packing, specific packing for export of mango, banana, grapes kinnow, sweet orange, and mandarin etc. 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. Preservatives, Colours permitted and prohibited in India.

Practical: Practice in judging the maturity of various fruits and vegetables. Conservation of zero energy cool chambers for on farm storage. 3& 4. Determination of physiological loss in weight (PLW), total soluble solids (TSS), total sugars, acidity and ascorbic and content in fruits and vegetables. Packing methods and types of packing and importance of ventilation. Pre cooling packing methods for export or international trade. Methods of prolonging storage life. Effect of ethylene on ripening of banana, sapota, mango, sapota. 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 local processing units. Visit to local market yards and cold storage units. Visit to local market and packing industries.

Reference:

1. “Phal Parirakshan – Siddhant Evam Vidhiya” – Dr. Shyam Sundar Shrivastava, *Central Book House, Raipur.*
2. “Fruit and Vegetable Preservation: Principles and Practices” – Dr.R.P. Shrivastava and Dr. Sanjeev Kumar, *IBDC, New Delhi.*
3. “Preservation of Fruits and Vegetables” – G.S.Siddappa, *I.C.A.R. New Delhi.*

4. “Home Scale Processing and Preservation of Fruits and Vegetables” – *C.F.T.R.I. Mysore.*
5. “Phal Parirakshan – Siddhant Evam Vidhiya” – Dr. Shyam Sundar Shrivastava, *Central Book House, Raipur.*
6. “Phal Aur Sabjiyon Ka Parikshan” – Dr.Dalpat Singh Khurdiya, *ICAR, New Delhi.*

COURSE TITLE	:	FARM-BUSINESS MANAGEMENT AND PROJECT APPRAISAL
COURSE No	:	AEC-311
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	3 rd YEAR / 1 st SEMESTER

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/K ratio, sensitivity analysis, characteristics of agricultural projects: preparation of project reports for various activities in agriculture and allied sectors: Dairying, poultry, fisheries, agro-industries etc.

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

References:

1. Wills, Walter,J.1979. An Introduction to Agri-business Management. The Interstate Printing and Publishers, Inc. Bombay.
2. Mondy/Sharplin, Management: Concept, Practices and skills, Educational Publishers, Jaipur.
3. Elkins, Management: Structure, functions and practices, Educational Publisher, Jaipur.
4. Render, B.Quantitative Analysis for Management, Educational Publishers, Jaipur.
5. Mondy and Neo, Personnel: The Management of Human Educational Publishers, Jaipur.
6. M.C.Shukla, Business Organization and Management, S.Chand and Company, New Delhi.

7. Y.K.Bhushan, Fundamentals of Business Organization and Management, Sultan Chand and Sons, Delhi-6.
8. W.David Downey, John, K. Trockey Agri-Business Management, Mc FRAWHILL International Book Company, New Delhi.
9. Kenneth D. Dubt.Principles of Management in Agricultural Business, Reston Publishing Company, Prentice Hall Company, Reston, Virgins.
10. Koontz, Harold and Wehrich, Heinz (1996). Essentials of Management Mc Graw Hill, Singapore.
11. Kotler, Philip (1999). Marketing Management; Analysis Planning and Control, Prentice Hall, New Delhi.
12. Mansfield, Edwin (1998). Managerial Economics. Wiley.
13. Robbins, P. Stephen (1999). Organizational Behaviour, Prentice Hall, New Delhi
14. Sharma, S.P. (1998). Operations Research. Mc Millan, India.
15. Van Horne, C. James (1990). Financial Management and Policy. Prentice Hall, New Delhi.
16. Gittinger, G. Price. Project Planning and Appraisal.

COURSE TITLE	:	CROP PESTS AND MANAGEMENT-I
COURSE NO.	:	AENT-311
CREDIT HOURS	:	2 (1+1)
YEAR/ SEMESTER	:	3 rd YEAR/ 1 st SEMESTER

Distribution, biology, nature and symptoms of damage and management strategies of following crop pests :

Theory:

Cereals :	Rice -	Gall midge, Stem borer, Leaf and plant hoppers, Leaf folder, Case worm, Army worm, Swarming caterpillar, Gundhi bug.
	Sorghum & Maize :-	Stem borer, Sorghum shoot fly.
Pulses :	Urid, Moong :-	Pea pod borer, Red hairy caterpillar
	Soybean :-	Girdle beetle, Stem fly, Hairy caterpillars.
	Pigeonpea :-	Pod borer, Pod fly, Plume moth, Pod bug.
Oilseeds:	Groundnut :-	Aphid, Leaf miner, White grub, Red hairy caterpillar.
	Sesamum :	Gall fly, Hawk moth, Leaf webber & pod borer
	Castor :	Castor semi looper, Capsule borer, Tussock hairy caterpillar.
Fibre crop :	Cotton :	Boll worms, Jassid, Red cotton bug, White fly, Aphids.
	Sunnhemp :	Sunnhemp hairy caterpillar
	Mesta :	Spiral borer of Mesta.
Vegetables :	Okhra :-	Shoot and fruit borer, Jassid, Whitefly.
	Brinjal :	Shoot and fruit borer, Stem borer, Mite.
	Chilly :	Thrips, Fruit borer.
	Sweet potato :	Sweet potato weevil.
	Moringa :	Blossom midge, Bud worm.
	Cucurbitaceous Vegetables :	Red pumpkin beetle, Fruit fly, Vine borer.
	Ginger :	Shoot borer, Fly maggot, Rhizome scale.
Fruits :	Banana :	Rhizome weevil, Stem borer
	Gauva :	Bark borer, Oriental fruit fly.
	Pomegranate :	Anar butterfly, Fruit fly.
	Cashew :	Tea mosquito bug, cashew stem and root borer.
	Sapota :	Leaf webber, Fruit fly,

Practical: Identification of pests, their damage symptoms and management of the crops mentioned under theory. Collection and preservation of pests and their damaged materials.

References:

1. A Textbook of Agricultural Entomology by H.S. Pruthi.
2. Entomology in India, By Entomological Society of India.
3. Some South Indian Insects by T.V. R. Ayyar.
4. Agricultural Pests of South Asia by A. S. Atwal. & G.S. Dhariwal.

5. Krishi Kit Vigyan By J.P. Sharma,
6. Arthik Kit Shastra By O.P. Singh,
7. Krishi Kit Vigyan by Upadhyaya and Mathur.
8. Applied Agricultural Entomology by L.K. Jha.
9. Faslon ke Hanikarak keet- S.V. Dhamdhere.
10. Insect pests of fruit crops, vegetables & spices & condiments and their management by Anand Prakash, J. Rao and V. Nandagopal.
11. Text book of applied Entomology Vol.1 by K.P. Shrivastava.
12. General and applied Entomology by B.V. David and T.N. Ananthakrishnan.
13. Hand book of Agriculture: ICAR.
14. Hand book of Horticulture: ICAR.
15. Insects & fruits by Bhutani , D.K. Periodical Expert Book Agency, New Delhi.
16. Faslon ke Haniker keet by Bindra Prasad Khare.
17. Phalon ke Hanikarak keet by Virendra Kumar Sharma.
18. Sabjiyon ke Haniker keet by Virendra Kumar Sharma.

COURSE TITLE : PRINCIPLES OF SEED TECHNOLOGY
COURSE No : APB-311
CREDIT HOURS : 3 (2+1)
YEAR/SEMESTER : 3rd Year / 1st SEMESTER

Theory:

Introduction & Importance of Seed Production, 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, Seed quality; Definition, Characters of good quality seed, Different classes of seed, Production of nucleus & breeder's seed, Maintenance and multiplication of pre-release and newly released varieties in self and cross-pollinated crops; Seed Production, Foundation and certified seed production in maize (varieties, hybrids, synthetics and composites); rice (varieties & hybrids); cotton and sunflower (varieties and hybrids); tomato, brinjal (varieties and hybrids), chillies and bhendi (varieties and hybrids) onion, bottle gourd and ridge gourd /Sponge gourd varieties and hybrids); Seed certification, phases of certification, procedure for seed certification, field inspection and field counts etc.; Seed Act 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, Seed Act 2000 and other issues related to seed quality regulation. Intellectual Property Rights, Patenting, WTO, Plant Breeders Rights, Varietal Identification through Grow-Out Test and Electrophoresis; Seed Drying: Forced air seed drying, principle, properties of air and their effect on seed drying, moisture equilibrium between seed and air, Heated air drying, building requirements, types of air distribution systems for seed drying, selection of crop dryers and systems of heated air drying, recommended temperature and depth of the seeds, management of seed drying, Planning and layout of seed processing plant; Establishment of seed processing plant. Seed processing: air screen machine and its working principle, different upgrading equipments and their use, Establishing a seed testing laboratory. Seed testing procedures for quality assessment, Seed treatment, Importance of seed treatment, types of seed treatment, equipment used for seed treatment (Slurry and Mist-O-matic treater), Seed packing and seed storage, stages of seed storage, factors affecting seed longevity during storage and conditions required for good storage, General principles of seed storage, constructional features for good seed warehouse, measures for pest and disease control, temperature control, Seed marketing, marketing structure, marketing organization, sales generation activities, promotional media, pricing policy; Factors affecting seed marketing.

Practical:

1. Seed sampling principles and procedure.
2. Physical Purity analysis of Field and Horticultural crops.
3. Germination analysis of Field and Horticultural crops
4. Moisture tests of Field and Horticultural crops
5. Viability test of Field and Horticultural crops
6. Seed health test of Field and Horticultural crops
7. Vigour tests of Field and Horticultural crops
8. Seed dormancy and breaking methods
9. Grow out tests and electrophoresis for varietal identification
10. Visit to Seed production plots of Maize, Sunflower, Bajra, Rice, Sorghum, Cotton, Chillies and Vegetables.
11. Visit to Seed processing plants
12. Visit to Seed testing laboratories
13. Visit to Grow out testing farms
14. Visit to Hybrid Seed Production farms
15. Varietal identification in seed production plots; Planting ratios, isolation distance, roguing etc.

References:

1. Seed Technology by Agrawal, R.L Oxford and IBH Pub, Co., New Delhi.
2. Seed Production Manual NSC and Rockefeller Foundation.
3. Techniques in seed Science and Technology Edited by P.K. Agrawal and M. Dadlani, South Asian Publishers, New Delhi.
4. बीज कार्यिकी एवं बीज परिक्षण- डॉ. फूलचन्द्र गुप्त एवं डॉ. रतनलाल अग्रवाल अनुवाद एवं प्रकाशन निदेशालय, गोबिन्द बल्लभ पन्त कृषि एवं प्रौद्योगिक विश्वविद्यालय, पन्तनगर (नैनीताल)।
5. बीज संस्थान-रामप्रकाश सक्सेना अनुवाद एवं प्रकाशन निदेशालय, गोबिन्द बल्लभ पन्त कृषि एवं प्रौद्योगिक विश्वविद्यालय, पन्तनगर (नैनीताल)।

COURSE TITLE : INTRODUCTORY NEMATOLOGY

COURSE No : APP-311

CREDIT HOURS : 2 (1+1)

YEAR/SEMESTER: 3rd YEAR / 1st SEMESTER**Theory :**

Introduction: History of phytonematology. Economic importance. General characteristics of plant pathogenic nematodes. Nematode general morphology and biology. Classification of nematodes upto family level with emphasis on groups containing economically important genera. Classification of nematodes by habitat. Identification of economically important plant nematodes upto generic level with the help of keys and description. Symptoms caused by nematodes with examples. **Study of White tip of paddy, ear cockle of wheat, root knot of tomato & brinjal**. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses. Different methods of nematode management. Cultural methods (crop rotation, fallowing, soil amendments, other land management techniques), physical methods (soil solarisation, hot water treatment) Biological methods, Chemical methods (fumigants, non fumigants). Resistant varieties. IDM.

Practical: Methods of survey – sampling methods, collection of soil and plant samples; Extraction of nematodes from soil and plant tissues following combined Cobb's decanting–sieving and Baermann funnel technique, counting and estimation of plant parasitic nematodes; Preparation of temporary and permanent mounts; Method of preparation of perineal patterns for identification of species of *Meloidogyne*; Study and identification of most important plant parasitic nematodes with special reference to their characteristics and symptomatology–*Meloidogyne*, *Pratylenchus*; *Heterodera*, *Ditylenchus*, *Globodera*, *Radopholus*., Experimental techniques used in pathogenicity studies with root knot nematode.

References :

1. Text book on Introductory Plant Nematology - R.K. Walia and H.K. Bajaj
2. Pod rog vigyan - B.P. Singh
3. Plant Pathology - G.N. Agrios
4. Plant Pathology - R.S. Mehrotra
5. Plant Pathology - P.D. Sharma

COURSE TITLE : FARM POWER, MACHINERY & RENEWABLE ENERGY

COURSE No : AENGG-311
CREDIT HOURS : 3 (2+1)
YEAR/SEMESTER : 3rd YEAR / 1st SEMESTER

Theory :

Farm power in India: sources, I.C engines, working principles, two stroke and four stroke engines, I.C. engine terminology, different systems of I.C. engine. Tractors, Types, Selection of tractor and cost of tractor power. Tillage implements: Primary and Secondary tillage implements, Implements for intercultural operations, seed drills, paddy transplanters, plant protection equipment and harvesting equipment; Equipment for land development and soil conservation.

Energy sources, Introduction, Classification, Energy from Biomass, Types of biogas plants, constructional details, Biogas production and its utilization, Agricultural wastes, Principles of combustion, pyrolysis and gasification, Types of gasifiers. Solar energy, Solar flat plate and focussing plate collectors, Solar air heaters, Solar space heating and cooling, Solar energy applications / Solar energy gadgets, Solar cookers, Solar water heating systems, solar grain dryers, Solar photo voltaic systems, solar lantern, Solar street lights, solar fencing, Solar pumping systems. Wind energy, Types of wind mills, Constructional details & application of wind mills. Liquid Bio fuels, Bio diesel and Ethanol from agricultural produce, its production & uses.

Practical: Study of different components of I.C. Engine; Study of working of four stroke engine; Study of working of two stroke engine; Study of M.B. plough, measurement of plough size, different parts, horizontal and vertical suction, determination of line of pull etc.; Study of disc plough; Study of seed-cum-fertilizer drills-furrow opener, metering mechanism, and calibration; Study, maintenance and operation of tractor; Learning of tractor driving; Study, maintenance and operation of power tiller; Study of different parts, registration, alignment and operation of mower. Study of different inter cultivation equipment in terms of efficiency, field capacity; Repairs and adjustments and operation of sprayers; Repairs and adjustments and operation of dusters; Study of paddy transplanters.

Constructional details of KVIC & Janatha type biogas plants; Constructional details of Deen Bandu type biogas plants; Field visit to biogas plants; To study and find the efficiency of solar cooker; To study and find the performance of a solar dryers; Study and working of solar photovoltaic pumping system; Study and performance evaluation of domestic solar water heater; Study and performance evaluation; To study the performance of different types of wind mills; Field visit to wind mills; To study the processing of Bio-diesel production from Jatropha.

Reference:

1. Michael, A.M. and Ojha, T.P. 2004. Principles of Agricultural Engineering, Vol. I, Jain Brothers, New Delhi.
2. Jain, S.C. And Rai, C.R. 2001. Farm Tractor – Maintenance & Repair.
3. Culpin, C. 1978. Farm Machinery Granada Publishing Ltd., London.

4. Kepner, R.A., Bainer, R. and Barger, E.L. 1987. Principles of Farm Machinery, C.B.S. Publishers and Distributors, New Delhi.
5. Smith, H.P. and Wilkes, L.H. 1979. Farm Machinery and Equipment, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
6. Ali, Irsad. 2000. Farm Machinery and Surveying Kitab Mahal Pvt. Ltd., Allahabad.
7. Moses, B.O., Frost, K.R. 1968. Farm Power, John Wiley and Sons. Inc., New Delhi.
8. Liljedhl, B.L. 1979. Tractors and their Power Units, John Willey and Sons. New York.
9. Ravindranath, N.H. and Hall, D.D. 1995. Biomass, Energy and Environment: A Developing Country Perspective from India. Oxford University Press, New York.
10. Pimentel, D. 1980. Handbook of Energy Utilization in Agriculture, CRC Press, Boca Ralon, Florida, USA.
11. OECD/IEA, 1991. Guidelines for the Economic Analysis of Renewable Energy Technology and its Applications. International Energy Agency, France.

COURSE TITLE	:	PISCICULTURE
COURSE No	:	AFS-311
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	3 rd Year / 1 st SEMESTER

Course Outline

1. Status and scope of Fisheries in India.
2. Basic morphological features of fish
3. Systematics of cultivable fishes
4. Pond ecosystem, oxygen balance, optimum physico chemical parameters for fish culture, cultivable species, stocking density & living space.
5. Design & construction of fish farm
6. Induced breeding in fishes
7. Carp Nursery & rearing management.
8. Composite fish culture: pond preparation, eradication of weeds & predatory fishes
9. Composite fish culture: liming, manuring, seed stocking, feed management and harvesting.
10. Integrated fish farming
11. Freshwater prawn farming
12. Major fish diseases and their control
13. Preliminary idea of Capture Fisheries resources and management in India.

Practical:

1. Identification of common phytoplankton.
2. Identification of common zooplankton.
3. Identification of aquatic weeds.
4. Identification of common aquatic insects
5. Identification of commercially important fishes, weed and predatory fishes.
6. Life cycle of major carps- Identification of egg, spawn, fry and fingerlings.
7. Field trip to fish farm and / or reservoir landing centre: Assignment be submitted of field trip.

References :

1. Introduction to fishes- S.S. Khanna.
2. A textbook of Fishery Science of India – R.B.L. Shrivastava.
3. Freshwater Aquaculture – R.K. Rath.
5. भारत में मत्स्य पालन – वी. पी. दुबे
6. मछली पालन एक उद्योग – डॉ. विश्वरमण प्रसाद सिन्हा
7. मछली पालन के नये आयाम – डॉ. ए.के. सिंह
8. Aquaculture - Kondaia
- 9th जलजीव पालन – डा. ए. सी. पांडे

COURSE TITLE	:	DISASTER MANAGEMENT
COURSE No	:	ALWM-311
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	3 rd Year / 1 st SEMESTER

Theory:

Basic concepts: Hazard, risk, vulnerability, disaster, capacity building. Multi-hazard and disaster vulnerability of India. Types of natural and manmade hazards in fisheries and aquaculture - cyclones, floods, droughts, tsunami, El-nino, algal blooms, avalanches, pollution, habitat destruction, over fishing, introduction of exotic species, landslides, epidemics, loss of bio-diversity etc. Causes, characteristics and impact of various disasters. Management strategies: pre-disaster, during disaster and post-disaster. Pre-disaster: prevention, preparedness and mitigation; different ways of detecting and predicting disasters; early warning, communication and dissemination, community based disaster preparedness, structural and non-structural mitigation measures. During disaster: response and recovery systems at national, state and local, coordination between different agencies, international best practices. Post-disaster: Methods for assessment of initial and long term damages, reconstruction and rehabilitation. Prevalent national and global management practices in disaster management. Agencies involved in monitoring and early warnings at district, state, national and global level. Sea safety and health.

Practical: Methods for assessment of initial and long term damages. Preparedness in pre, during and post disasters. Acquaintance with fire-fighting devices. Life saving appliances and first-aid. Operation and usage of communication channels and media. Uses of distress signals and technologies. Relief and rehabilitation measures, trauma counseling. Field visits and case studies. Group discussion.

COURSE TITLE	:	FARMING SYSTEMS AND SUSTAINABLE AGRICULTURE
COURSE No	:	AGRO-321
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	3 rd YEAR / 2 nd SEMESTER

Theory:

Farming system- definition, principles advantages and components. Factors affecting farming system. Farming system model for rainfed and irrigated situations. Crop diversification- definition, scope and advantages.

Sustainable agriculture- Introduction, definition, goal and current concepts, factors affecting sustainable agriculture. Judging the agricultural sustainability by ecological, economical and social means. Land, water and crop production related problems and its management for sustainable agriculture. Problems and technologies developed for High External Input Agricultural (HEIA) and Low External Input Agriculture (LEIA) areas in India.

Practical :

1. Preparation of cropping scheme for irrigated and rainfed situations.
2. Study of existing farming systems in nearby villages.
3. Preparation of farming system models for irrigated and rainfed situations.
4. Preparation of enriched Farm Yard manure.
5. Preparation of Vermicompost.
6. Visit to urban waste recycling unit; Study of profitable utilization of agril. wastes.
7. Visit to poultry, piggery, fishery, sericulture, beekeeping, lacculture and dairy units to study resource allocation, utilization and economics.
8. Visit to an organic farm to study various components and utilization.

Reference:

1. Jayanthi, C., Devasenapathy, P. and Vennila, C. 2008. Farming System : Principles & Practices. Satish Serial Publishing House.
2. Rangasamy, A. Annadurai, K., Subbian, P. and Chinnusamy, J. 2002. Farming system in the tropics. Kalyani Publishers, New Delhi.
3. Farm Management: R.K. Tandon and S.P. Dondhyal.
4. Principles and Practices of Agronomy: S.S. Singh.
5. Crop management: Indian society of Agronomy and ICAR.
- 6.

COURSE TITLE	:	ORGANIC FARMING
COURSE No	:	AGRO-322
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	3 rd YEAR / 2 nd SEMESTER

Theory:

Introduction, concept basic principles, definition relevance in present context; Organic production requirements. Role of organic farming for sustainable agricultural production. Crop management in organic farming - Choice of crop varieties, conversion period, diversified crops, contamination control, organic seed, crop rotation, residue management for animals, organic manures, vermi-composting, green manuring, recycling of organic residues, biofertilizers, Indigenous technology for nutrient management. Soil improvement and amendments. Diseases and pest management use of biocontrol agents, biopesticides pheromones, trap crops, bird perches. Weed management- cultural, mechanical and biological. National Programme for Organic Production (NPOP), National standards and norms for organic certification. National and International organic certification agencies, quality consideration, group certification, inspection, certification process, processing and handling, labelling, marketing, exports, organic logo.

Practical :

1. Field visit and raising of organically grown crop.
2. Visit in vermicompost, FYM, Enrichment of bulky organic manure preparation units.
3. Indigenous technology for nutrient management.
4. Indigenous technology for pest (weed, insect and diseases) management.
5. Vermicomposting, bulky manures and biofertilizers quality analysis, grading, packaging, post harvest management.

Reference:

1. Dahama, A.K. 2005. Organic Farming for sustainable agriculture. Agrobios (India), Jodhpur.
2. Veeresh, G.K., Shrivastava, K. and Suiglachar, M.A. 1997. Organic forming and sustainable Agriculture. Association for promotion of organic Farming, Bangalore.
3. Palaniappan, S.P. and Anandurai, K. 1999. Organic Farming: Theory and Practices. Scientific Publication, Jodhpur.
4. Gahlot, D. 2005. Organic Farming, Agrobios (India), Jodhpur.

COURSE TITLE : AGRICULTURAL MICROBIOLOGY

COURSE No : AMB-321

CREDIT HOURS : 2 (1+1)

YEAR/SEMESTER: 3rd YEAR / 2nd SEMESTER**Theory:**

History of Microbiology: Spontaneous generation theory, Role of microbes in fermentation, Applied areas of Microbiology, Metabolism in bacteria: ATP generation, chemoautotrophy, photo autotrophy, respiration, fermentation. Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur, Biological nitrogen fixation. Microflora of rhizosphere and phyllosphere, microbes in composting. Microbiology of water. Beneficial microorganisms in Agriculture: Biofertilizer (Bacterial, Cyanobacterial and Fungal), Microbial insecticides, Microbial agents for control of plant diseases, Biodegradation, Biogas production, Biodegradable plastics, Plant – Microbe interactions.

Practical: General instructions, Familiarization with instruments, materials, glassware etc. in a microbiology laboratory : Practice of Aseptic methods: I - Evaluation of aseptic technique with Nutrient broth tubes. II- Evaluation of aseptic technique with a Nutrient agar plate. Methods of Sterilization and preparation of media I- Preparation of nutrient broth, nutrient agar plates, nutrient agar slants and nutrient agar stab; II- Sterilization of glassware by Dry heating; III - Sterilization of nutrient broth by Filtration. Plating methods for Isolation and Purification of bacteria I - Isolation of bacteria by Streak plate method. II - Isolation of aerobic spore forming bacteria by Enrichment using Streak plate method. III - Checking of purity of a bacterial culture by Streak plating method. Identification of bacteria by staining methods and Biochemical tests: I- Morphological examination of bacteria by Simple and Differential staining. II – Different biochemical tests for identification of bacterial culture; Enumeration of bacteria: I - Enumeration of bacteria by Stain slide method. II- Enumeration of bacteria by Most probable number method. III - Enumeration of bacteria by Pour plate method and Spread plate method.

References :

1. Alexander, M. (1976). Introduction to Soil Microbiology (Willy Eastern Ltd., New Delhi).
2. Allen, A. benton and W.E.Werner (1976). Field Biology and Ecology (Tata- McGraw Hill Pub. Co., New Delhi)
3. Atlas, R.M. (1995). Microorganisms in Our World (Wm. C. Brown Pub., Oxford).
4. Atlas, R.M. (1997). Hand Book of Microbiological Media (CRC Press, New York).
5. Burn, R.G. and J.H Slater (1982). Experimental Microbial Ecology (Blackwell Scientific Pub., Edinburg).
6. Buscot, F. and A. Varma (eds.) (2005). Microorganisms in Soils: Roles in Genesis and Function (Springer –Verlag Berlin).
7. Kannaiyan, S., K. Kumar and K. Govindarajan (eds.) (2004). Biofertilizers Technology (Scientific Pub., Jodhpur).

8. Motsora, M.R., P.Bhattacharya and Beena Srivastava (1995). Biofertilizer Technology, Marketing and Usage- A Source Book-cum-Glossary (FDCO, New Delhi).
9. Mukerji, K.G., C.Manoharachary and B.P. Chamola (Eds.) (2002). Techniques in Mycorrhizal Studies (Kluwer Academic Pub., Netherlands).
10. Nutman, P.S. (1976). Symbiotic Nitrogen Fixation in Plants (Cambridge Univ. Press, London).
11. Rangaswami, G. and D.T. Bagyaraj (2002). Agricultural Microbiology (Prentice Hall of India Pvt. Ltd., New Delhi).
12. Subbarao, N.S.(1993). Biofertilizers in Agriculture and Forestry (Oxford and IBH Pub. Co., New Delhi).
13. Subbarao, N.S. (2005). Soil Microorganisms and Plant Growth (Oxford & IBH Pub. Co., New Delhi).
14. Stainer, R.Y., E.A. Adelberg and J.Ingeaham (1986). The Microbial World (Prentice Hall, U.S.A.).
15. Vincent, J.M. (1970). A Manual for the Practical Study of the Root Nodule Bacteria. (Black Well Scientific Pub, Oxford).
16. Waksman, Selman A. (1961). Soil Microbiology (John Wiley & Sons, New York).
17. Walker, N. (1975). Soil Microbiology (Betterworths, London).

COURSE TITLE : **PRODUCTION ECONOMICS
AND FARM MANAGEMENT**
COURSE No : AEC-321
CREDIT HOURS : 2 (1+1)
YEAR/SEMESTER : 3rd YEAR / 2nd SEMESTER

Theory :

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

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

References:

1. Dhondyal. S.P.. "Farm Management -An Economic Analyst". Friends Publications. Merrut.
2. Doll. J .P .& Ozazem. F. "Production Economics Theory with application" Grid Inc. Columbus Chio.
3. Heady. E.O. and Dillon. J.L. "Agricultural Production Function". Kalyani Publishers. Ludhiana.
4. Johl. S.S. and Kapoor. T .P ."Fundamental of farm Business Management". Kalyani Publishers. New Delhi.
5. Kahlon. A.S. and Singh. K. " Economics of Farm management in India- Theory and Practices". Allied Publishers Pvt. Ltd. New Delhi.
6. Sankhayan. P .L. " Introduction to the Economics of Agricultural Production. Prentice Hall of India Pvt. Ltd. New Delhi.
7. Singh. K. and Pandey. R.N. Adhunik Farm Prabandh". G.P. Pant Agril. and Tech. University Pant Nagar (**Hindi**).
8. Doll, J.P. and Frank Orazem (1978). Production Economics, Grid Inc., Columbus, Ohio.
9. Gujarati, D.N.(1995). Basic Econometrics, McGraw Hill, Singapore.
10. Heady, E.O. (1968). Economics of Agricultural Production and Resource Use, Prentice Hall, Inc., New York

**COURSE TITLE : PROTECTED CULTIVATION
AND POST HARVEST TECHNOLOGY**

COURSE No : AENGG-321

CREDIT HOURS : 2 (1+1)

YEAR/SEMESTER: 3rd YEAR / 2nd SEMESTER

Theory:

Green house technology, Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of greenhouse for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, Typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis. Choice of crops for cultivation under greenhouses, problems / constraints of greenhouse cultivation and future strategies. Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics. Threshing, threshers for different crops, parts, terminology, care and maintenance. Winnowing, manual and power operated winnowers, care and maintenance. Groundnut decorticators, hand operated and power operated decorticators, principles of working, care and maintenance. Maize shellers & castor shellers. Drying, grain drying, types of drying, types of dryers. Storage, grain storage, types of storage structures. Fruits and vegetables cleaning, machinery for cleaning of fruits and vegetables, care and maintenance. Grading, methods of grading, equipment for grading of fruits and vegetables, care and maintenance. Size reduction. equipment for size reduction care and maintenance. Evaporation, Principle, types of evaporators, quality standards – FAQ, ASTA, FPO, FDA.

Practical: Study of different types of green houses based on shape, construction and cladding materials; Calculation of air rate exchange in an active summer winter cooling system; Calculation of rate of air exchange in an active winter cooling system; Estimation of drying rate of agricultural products inside green house; Testing of soil and water to study its suitability for growing crops in greenhouses; The study of fustigation requirements for greenhouses crops and estimation of E.C. in the fustigation solution; The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization; Visit to commercial green houses; Study of threshers, their components, operation and adjustments; Winnowers, their components, operation and adjustments; Study of different components of groundnut decorticator; Study of maize shellers; Study of castor shellers; Study of improved grain storage structure; Study of dryers; Study of cleaners & graders.

Reference:

1. Use of Plastics in Agriculture. 1999. The National Committee on the Use of Plastics in Agriculture, New Delhi.
2. Shrivastava, P.K., Maheshwari, R.C., Ojha, T.P. and Alam, A.: Plastics in Agriculture.

3. Pandey, P.H. 1998. Principles and Practices of Post-harvest Technology, Kalyani Publishers, New Delhi.
4. Arthey, D. and Ashurst, P.R. 1966. Fruit Processing, Chapman and Hall, New York.
5. Pantastico, E.C.B. 1975. Postharvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables, AVI Publishing Co., New Delhi.
6. Ranganna, S. 2000. Handbook of Analysis and Quality Control for Fruits and Vegetable Products, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
7. Michael, A.M. and Ojha, T.P. 2004. Principles of Agricultural Engineering, Vol. I, Jain Brothers, New Delhi.
8. Sahay, K.N. and Singh, K.K. 1994. Unit Operations of Agricultural Processing, Vikash Publishing House Pvt. Ltd., New Delhi.
9. Culpin, C. 1978. Farm Machinery Granada Publishing Ltd., London.
10. Kepner, R.A., Bainer, R. and Barger, E.L. 1987. Principles of Farm Machinery, C.B.S. Publishers and Distributors, New Delhi.

COURSE TITLE	:	ENVIRONMENTAL AND FORESTRY SCIENCE
COURSE No	:	AFOR-321
CREDIT HOURS	:	3 (2+1)
YEAR/SEMESTER	:	3 rd YEAR / 2 nd SEMESTER

Theory :

Scope and importance of environmental studies. Natural resources: Renewable and renewable resources. Ecosystems: Definition, concept, structure and functions. Producers, consumers and decomposers of an ecosystem. Energy flow in the ecosystem. Types of ecosystems. Bio-diversity: Definition, classification, threats to biodiversity and its conservation, Environmental pollution: Causes, effects and control of air, water, soil, thermal, noise and marine pollution. Disaster management. Floods, earthquakes, cyclones and land slides. Social issues and the environment, unsustainable to sustainable development. The Environment Protections Act, The Air Act, The water Act, The Wildlife Protection. Act and Forest Conservation Act. Woman and child welfare, HIV/AIDS and Role of information technology on environment and human health.

Definition of forest & forestry, Branches of forestry and their relationships, Objectives and scope of silviculture, Locality factors, Forest types of India, Natural and Artificial regeneration, Establishment Forest Nurseries, Types of forest nurseries, Preparation of nursery stock, Plantation techniques, Afforestation of problematic site – Saline & alkaline soils, Desert areas, Coastal sands and Ravine lands. Road side, Railway and Farm forestry plantations; Tending, Definition of silvicultural systems, objectives and classification of silvicultural systems, clear felling, shelter wood and selection systems.

Practical: Collection, processing and storage of effluent samples: Determination of Bio-Chemical oxygen demand (BOD) in effluent samples; Determination of chemical oxygen demand (COD) in effluent sample: Estimation of dissolved oxygen in effluent samples; Determination of sound level by using sound level meter; Estimation of species abundance of plants; Estimation of pesticide contamination in Agro-Ecosystem; Visit to Social Service Organisation /Environmental Education Centre; Study of transpiration and water balance in plants; Visit to a local polluted site.

A visit to natural forests, plantations, nurseries, Identification of tree species – timber, firewood, fodder and ornamental species, Preparation of Herbarium and seed collection, Layout & preparation of Nursery beds, Potting mixture and raising seedlings in nursery. Digging of different types of pits, pit filling and planting methods.

References :

1. Ecology, Environment and Resource Conservation – J.S. Singh, S.P. Singh & S.R. Gupta.
2. Text book & Environmental studies (UGC, Universities press) – Erach Bharucha
3. Principles and practices of silviculture – L.S. Khanna.
4. Hand book of Forestry – A.P. Dwivedi.

5. Silvicultural systems – Ramprakash & L.S. Khanna.
6. Ecology – E.P. Odum
7. Biodiversity & Sustainable Conservation- Darshan Kumar
8. Environmental Pollution and Management – P.C. Trivedi
9. Plantation Forestry – R.K. Luna
10. Nursery Technology – S.S. Negi
11. वनवर्धन – L.S. Khanna
12. कृषि वानिकी के सिद्धान्त – रामनिवास ए.के.आर. सोलंकी
13. कृषि वानिकी – श्याम सुन्दर श्रीवास्तव

COURSE TITLE	:	CROPS PESTS AND MANAGEMENT - II
COURSE NO.	:	AENT-321
CREDIT HOURS	:	2 (1+1)
YEAR/ SEMESTER	:	3rd YEAR/ 2nd SEMESTER

Distribution, biology, nature and symptoms of damage and management strategies of following pests:

Theory:

Cereals :	Wheat :	Stem borer, Termites.
Pulses :	Gram :	Pod borer, Cut worm.
	Pea :	Aphid, Pod borer
	Lathyrus	Thrips
Oilseeds :	Linseed :-	Bud fly, Linseed caterpillar, Thrips, Jassids.
	Safflower :	Aphid, Bud fly.
	Sun flower & Niger :	Bihar hairy caterpillar.
	Mustard :	Aphid, Sawfly, Painted bug.
Cash crops :	Sugarcane :	Top shoot borer, stem borer, sugarcane leaf hopper, whitefly, Mealy bug, Termite.
	Potato :	Tuber moth, Aphid, Cut worm.
Vegetables:	Cruciferous :	Cabbage semi looper, Diamond back moth, Leaf webber, Cabbage borer
	Tomato :	Fruit borer, Leaf miner, Stem borer
	Onion & Garlic :	Thrips, Tobacco caterpillar, Onion fly.
	Coriander :	Aphid, White fly, Flower stink bug.
Fruit:	Mango:	Inflorescence midge, Mango shoot gall psylla, Mango hopper, Mealy bug, Stone weevil, Stem borer
	Citrus :	Lemon butter fly Citrus psylla, Fruit sucking moth, Whitefly, Leaf miner.
	Papaya :	Fruit fly, Aphid, White fly, Mite.
	Ber :	Ber fruit fly
	Litchi :	Litchi bug, Leaf roller, White fly, Black hussain fly, Mite
	Tamarind :	Fruit borers, Mealy bug, Scale insect.
	Stored grain pests :	Pulse beetle, Rice weevil, Grain moth, Red rust flour beetle, Khapra beetle, Lesser grain borer-their biology, damage, preventive and curative methods of control.

Practical: Identification of pests, their damage symptoms and management of the crops mentioned under theory. Collection and preservation of pests and their damaged materials.

References:

1. Bharat Ki Fasle – Chhidda Singh and Om Prakash
2. Bharat Ki Pramukh Fasle – Kalicharan Sharma
3. Kharif and Rabi Ki Fasle – Om Prakash
4. Sasya Vigyan – Jagannath Singh
5. Hand Book of Agriculture : ICAR
6. Scientific crop production : C. Thakur
7. Field crops : Y. M. Iyer.
8. Cereal crops : W.H. Leonard and J.H. Martin.
9. Agricultural pests of South Asia by A.S. Atwal & G.S. Dhariwal
10. Insect pests of fruit crops, vegetables & spices & condiments and their management by Anand Prakash, J. Rao and V. Nandagopal.
11. Text book of applied Entomology Vol. I by K.P. Shrivastava.
12. General and applied Entomology by B.V.David and T.N. Ananthakrishanan.
13. Hand book of Horticulture :ICAR
14. Faslon ke Haniker keet by Bindra Prasad Khare.
15. Phalon ke Hanikarak keet by Virendra Kumar Sharma.
16. Sabjiyon ke Haniker keet by Virendra Kumar Sharma.

**COURSE TITLE : EXTENSION METHODOLOGIES FOR
TRANSFER OF TECHNOLOGY**

COURSE No : AEXT-321

CREDIT HOURS : 2 (1+1)

YEAR/SEMESTER: 3rd YEAR / 2nd SEMESTER

Theory:

Communication – Meaning, Definition, Models, Elements and their Characteristics, Types and Barriers in communication. Extension Programme Planning – Meaning, Definitions of Planning, Programme, Project, Importance, Principles and Steps in Programme Development Process, Monitoring and Evaluation of Extension Programmes. Extension Teaching methods – Meaning, Definition, Functions and Classification. Individual contact methods – Farm and Home visit, Result Demonstration, Field trials – Meaning, Objectives, Steps, Merits and Demerits. Group contact methods – Group discussion, Method demonstration, Field Trips – Meaning, Objectives, Steps, Merits and Demerits. Small group discussion techniques – Lecture, Symposium, Panel, Debate, Forum, Buzz group, Workshop, Brain Storming, Seminar and Conference. Mass contact Methods – Campaign, Exhibition, Kisan Mela, Radio & Television – Meaning, Importance, Steps, Merits & Demerits. Factors influencing in selection of Extension Teaching Methods and Combination (Media Mix) of Teaching methods. Innovative Information sources – Internet, Cyber Cafes, Video and Tele conferences, Kisan call centers, Consultancy clinics. Agricultural Journalism – Meaning, Scope and Importance, Sources of news, Types, Merits and Limitations. Diffusion and Adoption of Innovations – Meaning, Definition, Models of adoption Process, Innovation – Decision Process – Elements, Adopter categories and their characteristics, Factors influencing adoption process. Capacity building of Extension Personnel and Farmers – Meaning, Definition, Types of training, Training to farmers, farm women and Rural youth – FTC and KVK.

Practical:

Simulated exercises on communication. Identifying the Problems, Fixing the Priorities and selecting a most important problem for preparation of a project. Developing a project based on identified problems in a selected village. Organization of Group discussion and Method demonstration. Visit to KVK / FTC. Planning and Writing of scripts for Radio and Television. Audio Visual aids – Meaning, Importance and Classification. Selection, Planning, Preparation, Evaluation and Presentation of visual aids. Planning & Preparation of visual aids – Charts, Posters, Over Head Projector, (OHP) Transparencies, Power Point Slides. Planning and Preparation of Agricultural Information materials – Leaflet, Folder, Pamphlet, News Stories, Success Stories. Handling of Public Address Equipment (PAE) System, Still camera, Video Camera and Liquid Crystal Display (LCD) Projector.

References:

1. Dhama, O.O., “Communication & Extension”. Ram Prasad & Sons, Agra
2. Berlo, D., “The Process of Communication” Holt, Rinehart and Winston, N.Y.

3. Brown James W., Lewis R.B., Hancle road, "AV Instruction Technology Media and Methods (5th Ed.) Mc. Graw Hill Co.
4. Rivers, William L., "Mass Media : Reporting, Writing, Editing" Harper & Row. New York.
5. Romiszowskey, A.J., "Selection and Use of Instructional Media Kegan Page, London.
6. Rogers, E.M. and Rekha Agrawal "Communication in organization, Free Press :N.Y. 1976.
7. Rogers A.M., "Modernization Among Peasants", Holt, Rinehart and Winston, Inc.
8. Kemp, Jorrol, E. and Willard R. Card, "Planning and Producing Audio-Visual Materials".
9. Haas and packer, "Preparation and Use of Audio-Visual aids".
10. Kamath, M.C., "Writing for Farm Families.
11. Fox Rodney, "Agricultural and Technical Journalism".
12. Rogers, E.M. "Diffusion of innovation (3rd Ed.). The Free Press "N.Y.
13. Rogers, E.M. "Communication Technology : The New Media Society". The Free Press : Glencoe, Illinois, USA.
14. Heinich, R. and Mdenda, M & Russell, J.D., "Instructional Media and New Technologies of Instruction (end Ed.) John Willey & Sons, N.Y.
15. Reddy, A.A. "Extension Education" Shree Lankshmi Press, Bapatla, Guntur (A.P.)
16. Supe, S.V. "An Inroduction to Extension Education" OXFORD & IBH PUBLISHING CO.
17. Shrivastava J.P. "Prasarki (Extension" Amen Publishing House, Meeruth).
18. Dimensions of Agricultural Extension, A.K. Singh, Lakhani Singh, R. Ray Burman.
19. Agricultural Extension, A.W. Vanden Ban, H.S. Hawkins.
20. Extension Communication and Management, G.L. Ray

COURSE TITLE : MANURES, FERTILIZERS AND AGRO-CHEMICALS

COURSE No : ASOIL-321

CREDIT HOURS : 3 (2+1)

YEAR/SEMESTER : 3rd YEAR / 2nd SEMESTER

Theory:

Introduction – Raw materials – Manures – Bulky and concentrated – FYM, Composts – Different methods of composting, Vermicomposting, Green manures, Oil cakes, Sewage and sludge – Biogas plant slurry, Plant and animal refuges. Fertilizers – classifications nitrogenous, phosphatic & potassic fertilizers. Manufacturing processes and properties of ammonium sulphate, urea, calcium ammonium nitrate, ammonium nitrate, ammonium sulphate nitrate, single super phosphate, enriched super phosphate, diammonium phosphate, ammonium poly phosphate, muriate of potash and sulphate of potash and complex fertilizers their fate and reactions in the soil, Secondary and micronutrients fertilizers, Amendments. Fertilizer Control Order, Fertilizer storage; Biofertilizers and their advantage, Organic chemistry as prelude to agro chemicals, Diverse types of agrochemicals, Botanical insecticides (Neem), Pyrethrum, Synthetic pyrethroids. Synthetic organic insecticides, Major classes, Properties and uses of some important insecticides under each class. Herbicides – Major classes – Properties and uses of 2, 4-D, atrazine, glyphosate, butachlor benthocarb; Fungicides – Major classes – Properties and uses of carbendazim, carboxin, captan, tridemorph and copper oxychloride – Insecticides Act, Plant growth regulators.

Practical:

1. Determination of total nitrogen and phosphorus in manures / composts
2. Determination of Ammoniacal and nitrate nitrogen manures / composts
3. Determination of Water soluble P₂O₅ in fertilizer
4. Determination of potassium in fertiliser,
5. Determination of calcium, sulphur and zinc contents in fertilizers
6. Determination of Adulteration in fertilizer.
7. Argentimetric and iodometric titrations
8. Analysis of lindane metasystox, endosulfan, malathion,
9. Analysis of copper and sulphur fungicides –
10. Compatibility of fertilizers with pesticides.
11. COD in organic wastes –

Reference:

1. Manures and Fertilizer By Yawalkar
2. Organic Manures By Gaur et al. published by ICAR, New Delhi.
3. Chemistry of Insecticides and Fungicides, by Shriramalu published by Oxford and IBH, New Delhi.
4. Chemistry of Herbicides, by Shriramalu published by Oxford and IBH, New Delhi
5. Methods of Pesticides Analysis by Shriramalu published by Oxford and IBH, New Delhi.

COURSE TITLE	:	PRINCIPLES OF BIOTECHNOLOGY
COURSE No	:	ABT-321
CREDIT HOURS	:	2 (1+1)
YEAR/SEMESTER	:	3 rd YEAR / 2 nd SEMESTER

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, Micro propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture, Factors affecting above *in-vitro* culture; 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 improvement. Genetic engineering; Restriction enzymes; Vectors for gene transfer – Gene cloning – Direct and indirect method of gene transfer – Transgenic plants and their applications. Blotting techniques – DNA finger printing – DNA based markers – RFLP, AFLP, RAPD, SSR and DNA Probes – Mapping QTL – Future prospects. MAS, and its application in crop improvement.

Practical: Requirements for Plant Tissue Culture Laboratory; Techniques in Plant Tissue Culture; Media components and preparations; Sterilization techniques and Inoculation of various explants; Aseptic manipulation of various explants; Callus induction and Plant Regeneration; Micro propagation of important crops; Anther, Embryo and Endosperm culture; Hardening / Acclimatization of regenerated plants; Somatic embryogenesis and synthetic seed production; Isolation of protoplast; Demonstration of Culturing of protoplast; Demonstration of Isolation of DNA; Demonstration of Gene transfer techniques, direct methods; Demonstration of Gene transfer techniques, indirect methods; Demonstration of Confirmation of Genetic transformation; Demonstration of gel-electrophoresis techniques.

Reference:

1. Introduction to Plant Biotechnology : P.K. Gupta
2. Biotechnology : B.D. Singh
3. Introduction to Plant Biotechnology : Chawla
4. Plant Tissue culture: S.K. Das, ICAR Publication Bhojwani
5. Plant Biotechjology (Vol. 1 to 4) : Y.P.S. Bajaj