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**Horticulture**

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**Agricultural Engineering**

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18AG1001    FUNDAMENTALS OF AGRONOMY

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Course objectives
- To have a general understanding of the Agronomy, seasons, crop and its classification
- To appraise the students about crops, planting/sowing, growth and factors influencing growth and crop nutrition and its general management
- To study the impact of weeds on crop production and its management

Course outcomes
- Basics of crop characteristics and its classifications understood
- Fundamentals of growth, factors influencing and its relationship with nutrients studied
- Scientific knowledge on weeds its impacts on crop growth and the Integrated weed management studied

Theory

Practical
Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro-climatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill.

References
18AG1002 AGRICULTURAL HERITAGE

Credits : 1:0:0

Course objectives

- To have a general understanding of importance of the agriculture and agriculture resources in India
- To study the agriculture heritage of India from ancient to modern period
- To study the indigenous traditional knowledge in agriculture and the crop voyage in India and the world
- To study the gender perspective and task of farm women and women’s empowerment and self-help groups

Course outcomes

- Studied the agriculture resources and development of agriculture in India from ancient to modern period
- Indigenous traditional knowledge (ITK) and its uses in agriculture learned
- Gained knowledge on gender issues in agriculture, women empowerment and self help groups

Theory

Agriculture scope; Importance of agriculture and agricultural resources available in India; Origin of agriculture- branches of agriculture- agricultural systems in the world-Crop significance and classifications; Green revolution and its impact- National agriculture setup in India; ICAR and SAUs- Current scenario of Indian agriculture; Indian agricultural concerns and future prospects-CGAIR and international institutions. Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era; Natural calamities and famines- Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world; Introduction to gender perspectives in agriculture- gender concepts- multiples roles of women- Women in agriculture- multifaceted roles and tasks of farm women- gender, poverty and livelihoods.Gender equity and strategies for rural women’s empowerment- self-help groups. Farm mechanization and women- Occupational health hazards- Women friendly agricultural technology- Ergonomical approaches- Technological options

References


18AG1003 INTRODUCTORY AGRICULTURAL METEOROLOGY AND CLIMATE CHANGE

Credits : 1:0:1

Course Objectives:

- To understand the role of agricultural meteorology in crop production
- To learn climatic factors and their measurements
- To study the fundamentals of climate change
To provide knowledge on the effect of climate change on crop production

**Course Outcome:**
- Agro-climatic factors understood
- Measurement and estimation techniques for climatic parameters learned
- Fundamentals of climate change studied
- Effect of climate change on crop production understood

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

**Practical**

**References**

**18AG1004  FUNDAMENTALS OF PLANT BIOCHEMISTRY**

**Credits : 2:0:1**

**Course Objectives:**
- The students will know, why the broad spectrum of biochemistry is important in medicine, agriculture, pharmaceuticals, and ethics;
- To educate on the importance of Biomolecules with structure classification and function.
- To understand about the generation and storage of metabolic energy
Course Outcome:
- Knowledge about developments in biochemistry. Cell structure, water and major molecules of life.
- Understand overall aspects of the integration of metabolic processes;
- Basics of carbohydrates, proteins, enzymes, vitamins, nucleic acids, minerals and lipids will be understood.

Theory

Practical

References

18AG1005 AGRICULTURAL MICROBIOLOGY

Credits: 2:0:1

Course Objectives:
- To learn about the structure of microbes.
- To have a general understanding on soil microbiology.
- To study the beneficial use of microorganisms.

Course Outcomes:
- Structure of microbes studied.
- Action of microbes in soils understood.
- Beneficial use of microbes learned.

Theory
Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photoautotrophy, growth. Bacterial genetics: Genetic recombination, transformation,

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

References

18AG1006  RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

Credits : 2:0:0

Course objectives
- To get an idea of sociological behaviour of rural population
- To familiarize the functions of rural society social stratification and social changes
- To understand the behaviour pattern and theories of motivation

Course outcomes
- Students learnt the rural society and their behaviour pattern
- Students gained the practical knowledge of functions of social institution
- Familiarize the concept of agricultural extension practices

Theory

References
18AG1007 IRRIGATION WATER MANAGEMENT

Credits : 1:0:1
Course objectives
- To understand the water resources of the country and state
- To study the soil water plant relationship and soil moisture constant
- To introduce the concept of water requirement of crops and irrigation management

Course outcomes
- Students learnt the estimation of the irrigation requirement by various methods
- Students gained the practical knowledge of implementation of surface, pressurized and micro irrigation
- Familiarize the concept of water productivity and principles of drainage

Theory

Practical
Determination of bulk density by field method; Determination of soil moisture content by gravimetric method, tensiometer, electrical resistance block and neutron moisture meter; Determination of field capacity by field method; Determination of permanent wilting point; Measurement of irrigation water through flumes and weirs; Calculation of irrigation water requirement (Problems); Determination of infiltration rate; Demonstration of furrow method of irrigation; Demonstration of check basin and basin method of irrigation; Operation of sprinkler, drip and common micro irrigation systems; Visit to a water management research station

References

18AG1008 PRINCIPLES OF GENETICS AND CYTOGENETICS

Credits: 2:0:1
Course Objectives:
- To study mendelian concepts of heredity
- To impart knowledge on linkage and crossing over
- To make the student understand gene structure and function
- To study about genetic disorders

Course Outcome:
- Students will understand the concept of Mendelian principles
- Overview of Linkage and crossing over
- Understand the Gene structure and function
Theory

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

References

18AG1009  FUNDAMENTALS OF CROP PHYSIOLOGY

Credits : 2:0:1

Course Objectives:
- To introduce the students to crop physiology and biochemical changes during crop development.
- To impart knowledge on transport system in plants, photosynthesis and respiration.
- To understand growth and growth characteristics.

Course Outcome:
- Knowledge gained on different aspects of crop physiology.
- Learned detailed understanding of the physiological mechanisms involved in the uptake and transport of water and the translocation of food by plants.
- Study growth pattern of plants and growth parameters in crop production.

Theory
Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops; Growth analysis, Role of Physiological growth parameters in crop productivity.
Practical
Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO2 assimilation by Infra Red Gas Analyser (IRGA).

References

18AG1010 FUNDAMENTALS OF PLANT PATHOLOGY

Credits : 2:0:1

Course Objectives:
- To impart knowledge on plant diseases and plant pathogens
- To make the student understand the classification and life cycle of plant pathogens
- To learn basics of plant disease management

Course Outcome:
- Able to know and differentiate different plant pathogens and disease caused by them
- Knowledge on pathogen characteristics, reproduction, resting structures and transmission will be imparted
- Chemical nature, mode of action of different fungicide, Physical and bio-control measures will be studied

Theory
Practical

References

18AG1011 FUNDAMENTALS OF ENTOMOLOGY

Credits: 2:0:1

Course Objectives:
- To impart knowledge on morphology, anatomy and physiology of insects
- To make the student understand insect ecology and different IPM techniques
- To learn the insect systematics

Course Outcome:
- Insect body parts, organ systems - their structure, functions and modifications will be understood
- Knowledge on factors influencing pest occurrence and different (physical, chemical and biological) control measures will be gained
- Orders and families of Agricultural importance pests and their characteristics will be studied

Theory


Systematics: Taxonomy – importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acridae, Tettigoniidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Lophophoridae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Scythrididae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tephritidae. 

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

References

18AG1012 FUNDAMENTALS OF AGRICULTURAL ECONOMICS

Credits : 2:0:0

Course objectives
- To orient the students about the principles of economics and to get an idea of macro and micro economics
- To expose the basic theories of economics
- To understand the concept of agricultural economics and its relation with other subjects

Course outcomes
- Students learnt the concept of basic economic theories
- Familiarize the function of market and its impact on agricultural production
• Gained knowledge on agricultural finance and the role of banks and other credit agencies

Theory


References


18AG1013 FUNDAMENTALS OF SOIL SCIENCE

Credits : 2:0:1

Course Objectives:
• To impart knowledge about the soil forming process.
• To learn about physical properties of soil.
• To have a general understanding on soil chemical properties reactions.
• To study the impacts of soil pollution and the remediation measures.

Course Outcomes:
• Knowledge gained about the soil forming process.
• Physical properties of soil studied.
• Various soil chemical properties and reactions understood.
• Impact of soil pollution and remediation measures learnt.
The course is intended to orient the students with the concept of extension education and its importance in Agriculture development

- To expose the students with various rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis

- To make the students learn about the new innovations being brought into the Agricultural Extension in India

- To learn about the new trends in agriculture extension

Course Objective:

- Students learned the concepts of agricultural extension and rural development programs.

- New innovations in the area of agricultural extension in India understood

- Gained practical knowledge on watershed development and self-help groups

- New trends in agriculture extension learned

Course Outcome:

Theory

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and
post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc. Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

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

References
4. www.planning commission.nic.in
5. www.agricoop.nic.in
6. www.rural.nic.in

18AG1015 INTRODUCTION TO AGRICULTURE AND HORTICULTURE

Credits 2:0:0

Course Objectives:
- To introduce the scope of agriculture to engineering students
- To impact knowledge on soil-water-plant relationship
- To familiarize with plant growth and fertilizer application and irrigation

Course Outcome:
- Basics of agriculture science learned
- Soil-water-plant relationship learned
- Different stages of plant growth and application of fertilizers studied

Theory
Orientation to agriculture and agricultural engineering. Soils: Nature and origin of soil; soil forming rocks and minerals, soil forming processes, important soil physical properties and their importance. Ion

Reference books

18AG1016 INTRODUCTORY AGRO FORESTRY

Credits : 1:0:1

Course objectives
• To study the importance of forest and agroforestry systems in sustaining the land productivity
• To understand the crop tree interactions in different types of agroforestry systems
• To get an idea of the productive and protective functions of agroforestry

Course outcome
• Students learnt about the concepts of agroforestry practiced in various agro ecosystems
• Basic understanding of the multipurpose trees in agroforestry systems
• Beneficial effects of agro forestry such as nitrogen fixing, soil conservation, litter dynamics and nutrient cycles will be studied

Theory
Introduction – definitions of basic terms related to forestry, importance and objectives of silviculture, types of forests-salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations- tree stand management. Agroforestry – definition and concepts Agroforestry systems and practices- different agroforestry systems prevalent in the country and Tamil Nadu, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, plantation crop combinations, home gardens. Multi purpose trees in agroforestry, characteristics- Under storey components and diversification potentials- Component interactions- above ground and below ground interactions. Productive and protective functions- Nitrogen fixation- Soil conservation- Litter dynamics and nutrient cycling – Carbon
sequestration and climate change mitigation - Social forestry- concept and importance, practices in different agro ecosystems

**Practical**

**References**

**18AG1017 WEED MANAGEMENT**

**Credits : 1:0:1**

**Course Objectives:**
- To identify the weed species present in different agro ecosystems
- To study the different weed control methods
- Learn about herbicides and its formulations and integrated weed management

**Course Outcomes:**
- Students will familiarised about the weed species and weed classification
- Different weed control methods and management will be studied.
- Different herbicides and its formulations and integrated weed management will be understood.

**Theory**

**Practical**

**References**
18AG1018 PRODUCTION TECHNOLOGY FOR VEGETABLE, FRUIT AND PLANTATION CROPS

Credits: 2:0:1

Course Objective:
1. To impart knowledge on basic cultural practices of Vegetables, Fruits and Plantation Crops.
2. To insist on modern techniques to increase the yield and production.
3. To learn about the economic estimation of commercial Horticultural crops.

Course Outcome:
1. The student gains a thorough knowledge on basic production technology.
2. Familiarize on basic pruning and training techniques of fruits and plantation crops.
3. Acquaintance on commercial oriented cultural practices.

Theory
Area, production, economic importance and export potential of tropical and sub-tropical vegetable crops. Description of varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly sown/transplanted vegetable crops. Spacing, planting systems, water and weed management; nutrient management and deficiencies, use of chemicals and growth regulators. Cropping systems, harvest, yield, post-harvest handling, economics and marketing of tropical and subtropical vegetable crops such as tomato, brinjal, chillies, capsicum, okra, amaranthus, cluster beans, cowpea, lab-lab, snap bean, cucurbits, moringa, curry leaf, portulaca, basella, sorrel and roselle. Horticultural classification of fruits including genome classification. Horticultural zones of India, detailed study of area, production and export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards. Physiological disorders. Post-harvest technology, harvest indices, harvesting methods, grading, packaging and storage of the following crops. Mango, banana, grapes, citrus, papaya, sapota, guava, pomegranate, bael, ber, amla, anona, fig, pineapple, jackfruit, avocado, mangosteen, litchi, carambola, durian, rambutan, bilimbi, loquat, rose apple breadfruit and passion fruit. Bearing in mango and citrus, causes and control measures of special production problems, alternate and irregular bearing overcome, control measures. Seediness and kokkan disease in banana, citrus decline and casual factors and their management. Bud forecasting in grapes, sex expression and seed production in papaya, latex extraction and crude papain production, economic of production. History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by products utilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micropropagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of coconut, arecanut, oil palm, palmyrah palm, cacao, cashew nut, coffee, tea, Date palm and rubber.

Practical
Identification and description of tropical and sub-tropical vegetable crops; nursery practices and transplanting, preparation of field and sowing/planting for direct sown and planted vegetable crops. Herbicide use in vegetable culture; top dressing of fertilizers and intercultural; use of growth regulators; identification of nutrient deficiencies. Physiological disorder. Harvest indices and maturity standards, post-harvest handling and storage, marketing, seed extraction (cost of cultivation for tropical and sub-tropical vegetable crops), project preparation for commercial cultivation. Description and identification of varieties based on flower and fruit morphology in above crops. Training and pruning of grapes, mango, guava and citrus. Selection of site and planting system, pre-treatment of banana suckers, desuckering in banana, sex forms in papaya. Use of plastics in fruit production. Visit to commercial orchards and diagnosis of maladies. Manure and fertilizer application including bio-fertilizer in fruit crops, preparation
and application of growth regulators in banana, grapes and mango. Seed production in papaya, latex extraction and preparation of crude papain. Ripening of fruits, grading and packaging, production economics for tropical and sub-tropical fruits. Mapping of arid and semi-arid zones of India. Botanical description and identification of ber, fig, jamun, pomegranate, carissa, phalsa, wood apple, West Indian cherry, tamarind, aonla, bael and annon. Description and identification of coconut varieties, selection of coconut and arecanut mother palm and seed nut, planting of seed nuts in nursery, layout and planting of coconut, arecanut, oil palm, cashew nut, cacao gardens, manuring, irrigation; mulching, raising masonry nursery for palm, nursery management in cacao. Description and identification of species and varieties in coffee. Harvesting, grading, pulping, fermenting, washing, drying and packing of coffee, seed berry collection, seed extraction, treatment and sowing of coffee, epicotyl, softwood, grafting and top working in cashew, working out the economics and project preparation for coconut, arecanut, oil palm, cashew nut, cacao, etc. Mother plant selection, preparation of cuttings and rooting of tea under specialized structure, training, centering, pruning, tipping and harvesting of tea.

References

18AG2001 PRINCIPLES OF PLANT BREEDING

Credits: 2:0:1
Course Objectives:
- To impart knowledge on genetic diversity, inheritance and variation in crops
- To make the student understand different breeding methods in asexually propagated, self and cross pollinated crops
- To learn IPR, patenting, Plant Breeders and Farmers Rights

Course Outcome:
- Origin and diversity of different crops, components of inheritance and variations will be understood
- Students will be able to apply different breeding techniques for crop improvement
- Gain knowledge on IPR, patenting, Plant Breeders and Farmers Rights followed

Theory
Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility - genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/ diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and
hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and prebreeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer’s Rights.

**Practical**


**Reference books**


**18AG2002 CROP PRODUCTION TECHNOLOGY - I (KHARIF CROPS)**

**Credits : 1:0:1**

**Course Objectives:**
- To provide foundational understanding of kharif crop production
- To learn the economic importance of kharif crops
- To provide knowledge on cultural practices of kharif crops

**Course Outcome:**
- Economic importance of kharif crops understood
- Basic management for kharif crops production learned
- Cultural practices for crop production studied

**Theory**

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

**Practical**

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

**Reference**


**18AG2003 AGRICULTURAL FINANCE AND COOPERATION**

**Credits : 2:0:1**

**Course objectives**

- To get an idea of credit needs and its role in Indian agriculture
- To familiarize the sources of agriculture finance
- To learn the cooperative movement its principles and its significance in agricultural community

**Course outcome**

- Students learn the functions of banks and types of banks, role of RBI and NABARD in agricultural finance
- Students learn the credit availability and functions of different types of cooperative societies in the state
- Basic understanding of financial statements, balance sheets and income statements

**Theory**

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

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

**Practical**


References
3. RBI: https://www.rbi.org.in
4. NABARD: https://www.nabard.org
6. ADB: http://www.adb.org
7. Lead Bank: http://www.canarabank.com

18AG2005 LIVESTOCK AND POULTRY MANAGEMENT

Credits 3:0:1

Course objectives
- To understand the importance of farm animals
- To study characters of indigenous and exotic breeds of cattle, goat, buffalo, swine and poultry
- To study the management of farm animals, its nutrient requirement and its housing

Course outcome
- Understood the importance of farm animals and its influence in rural economy
- Gained knowledge on characteristics of indigenous and exotic breeds of cattle, goat, buffalo, swine and poultry
- Practical knowledge on management of farm animals, its nutrient requirement and its housing

Theory

Practical

Reference books

**18AG2008 CROP PRODUCTION TECHNOLOGY-II (RABI CROPS)**

Credits: 1:0:1

**Course Objectives:**
- To provide foundational understanding of *Rabi* crop production
- To learn the economic importance of *Rabi* crops
- To study the basic management for *Rabi* crop production
- To provide knowledge on cultural practices of *Rabi* crops

**Course Outcome:**
- Economic importance of *Rabi* crops understood
- Basic management for *Rabi* crops production learnt
- Cultural practices for crop production studied

**Theory**
Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals—wheat and barley, pulses-chickpea, lentil, peas, oilseeds—rapeseed, mustard and sunflower; sugar crops—sugarcane; medicinal and aromatic crops—mentha, lemon grass and citronella, Forage crops—berseem, lucerne and oat.

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

**Reference**

**18AG2009 PRODUCTION TECHNOLOGY FOR ORNAMENTAL CROPS AND LANDSCAPING**

Credits: 1:0:1

**Objective**
- To educate students on production technology of cut flowers, ornamental crops and turf management.
- To study the Landscape use of trees, shrubs and climbers
- Exposing the students to different styles of landscape gardening.
- To know about harvesting and post-harvest handling of flower crops.

**Outcomes:**
- Familiarized with the production technology of cut flowers, ornamental crops and turf management.
- Landscape use of trees, shrubs and climbers were studied
- Learnt about the various styles of gardening.
- Got familiarized with the harvesting and post-harvest handling of flower crops.
Theory

Practical

References books:

Credits : 1:0:1

Course objectives
- To learn about seed, grain and seed quality
- To introduce the concepts of seed certification, seed Act and seed test
- To have the knowledge about the foundation and certified seed production of cereals, pulses, oilseeds, fodder and vegetable crops

Course outcome
- Students learnt the seed production techniques
- Students enabled in identifying seed structure and morphology, physical characteristics of seed and biochemical tests
- Students capacitated in seed sampling, seed storage and seed marketing

Theory
Seed and seed technology: introduction, definition, its importance in increasing agricultural production. Difference between seed and grain and concept of seed quality. Deterioration causes of crop varieties and their control. Maintenance of genetic purity during seed production. Genetic and agronomic principles of seed production. Different classes of seed and truthfully labeled seed. Seed certification, phases of certification. Procedure for seed certification, field inspection. Foundation and certified seed production of important cereals (Rice, wheat and maize), pulses (Cowpea, mung, urd, pigeonpea, field bean and soybean), oilseeds (Sesame, coconut, sunflower, groundnut), fodder (Guinea grass, napier grass and lucern), and vegetables (Bhindi, tomato, brinjal, chillies and cucurbitaceous vegetables). Seed Act and Seed Act enforcement. Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983 and Seed Bill 2004 and other issues related to seed quality regulation. Varietal identification through electrophoresis and biochemical tests. Synthetic seeds and terminator gene technology. Detection of genetically modified crops. Transgene contamination in non-GM crops, GM crops and organic seed production. Physiological and harvestable maturity. Seed dormancy, internal and external factors affecting dormancy in seeds. Seed drying. Seed processing and their steps. Seed treatment, its importance, methods of application. Seed packing. Seed sampling and testing. Seed storage: general principles, stages and factors affecting seed longevity during storage.
Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies. Participatory seed production and seed village concept

Practical
Varietal identification through seed structure and morphology, physical characteristics of seed and biochemical tests. Germination test in field and horticultural crops. Quick viability test of field and horticultural crops. Seedling vigour tests. Seed sampling principles and procedures; Physical purity analysis of field and horticultural crops. Genetic purity test: Grow out test and electrophoresis. Roguing, field inspection and preparation of field inspection report. Seed production in major cereals, pulses, oilseeds and vegetable crops. Visit to seed testing laboratories, farms and seed processing plants.

References

18AG2012 PROBLEMATIC SOILS AND THEIR MANAGEMENT

Credits : 2:0:0

Course Objectives:
- To learn about soil health quality and irrigation water quality parameters.
- To have a general understanding on reclamation and management of problem soils.
- To provide knowledge on Remote sensing, GIS and land use pattern.

Course Outcomes:
- Soil quality and irrigation water quality parameters learnt.
- Reclamation and management of problem soils understood.
- Remote sensing , GIS and bioremediation procedures studied.
- Land use pattern studied.

Theory

References
2. William F. Bleam Soil and Environmental Chemistry (Second Edition) UW Madison, Department of Soil Science, Madison, WI, United States. Elsevier Inc. (Available Online)
18AG2013 AGRICULTURAL MARKETING, TRADE AND PRICES

Credits: 2:0:1

Course objectives
- To understand the concept of market structure and its classification
- To study the theories of demand and supply of agricultural produce in market oriented economy
- To learn the grading, packing, branding, labelling (AGMARK) of agricultural produce

Course outcomes
- Learnt the role of Government in agricultural marketing and price stability in agricultural produce
- General awareness of trade, present status of GATT, WTO, agreement on agriculture (AOA)
- Will be studying the role of public sector institutions namely CWC, SWC, FCI, CACP and DMI

Theory
Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer’s surplus of agri-commodities: nature and Concept of risk and uncertainty in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources - Positive and negative externalities in agriculture. Inefficiency and welfare loss, solutions-Important issues in economics and management of common property resources of land, water, pasture and forest resources Farm inventory- Methods of valuation of farm assets-Depreciation- Meaning-Methods of computation of depreciation Classification of farming-Type of farming – Specialization, Diversification, Mixed farming,Dry farming and Ranching – Systems of farming -co-operative farming, Capitalistic farming, collective farming, State farming and Peasant farming determinants of demand and supply of farm products, producer’s surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; Marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labelling (Agmark);Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel;number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;Risk in marketing: Types of risk in marketing: speculation & hedging; an overview of futures trading; Marketing Management-product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

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

References

18AG2014 INTRODUCTION TO BIOTECHNOLOGY

Credits : 1:0:1

Course Objectives:
- To expose the students to the basic scientific evidence and technical aspects of the different disciplines of biotechnology in agriculture (mainly for plants and crops).
- To understand the concepts and techniques in biotechnology
- Upon completion of this course the student should recognize the foundations of modern biotechnology and explain the principles that form the basis for recombinant DNA technology.

Course Outcome:
- Knowledge gained on different aspects of biotechnology
- Study the current applications of biotechnology and advances in the different areas like medical, microbial, environmental, bioremediation, agricultural, plant, animal, and forensic
- Learned the general principles of generating transgenic plants, animals and microbes

Theory
Biotechnology: Introduction to Biotechnology –scope and importance in agriculture; Structural organization of prokaryotic and eukaryotic cell. Nucleic acids -structure, function and types, Concepts of gene and genetic code, transcription and translation, mutations and their implications. Post transcriptional modification and RNA processing. Gene regulation and expression in prokaryotes and eukaryotes; DNA sequencing, Operons. Genetic engineering-Restriction enzymes; Gene isolation; Cloning vectors; Probes; Recombinant DNA technology– vaccines. Transgenic plants and Gene transfer technology, Animal Cell Culture, Hybridoma technology. Molecular and immunological techniques – PCR; immunoblotting; ELISA; Principle of hybridization; Northern blotting; Western blotting; Southern blotting; DNA fingerprinting; Restriction fragment length polymorphism., Biosensors. Concept of bioremediation of water, bioprocess engineering and bioprospecting.

Practical

References

18AG2015 ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

Credits : 2:0:1

Course Objectives:
- To know about the natural resources- Renewable and Non renewable
- To study about the Ecosystem, Biodiversity , Environmental pollution and conservation aspects
- To learn about the Natural and Man- made Disasters and their Management

Course Outcomes:
- Learnt about the natural resources- Renewable and Non renewable
- Studied about the Ecosystem, Biodiversity , Environmental pollution and conservation aspects
- Learnt about the Natural and Man- made Disasters and their Management

Theory
Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.


**Disaster Management**

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community – based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

**Practical**

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

**References**


18AG2037 SPICES, MEDICINAL AND AROMATIC CROPS

**Credits : 2:0:1**

**Course Objectives**

- To teach scope and importance of Spices, medicinal and aromatic crops
- To impart knowledge on production technology of Spices, medicinal and aromatic plants
- To impart knowledge on various processes, essential oil and their uses of Spices, medicinal and aromatic plants

**Course Outcome**

- Scope and importance of Spices, medicinal and aromatic crops learnt
- Production technology of Spices, medicinal and aromatic plants studied
- Gain practical knowledge various processes, essential oil and their uses of Spices, medicinal and aromatic plants

**Theory**

History, scope, opportunities and constraints in the cultivation and maintenance of medicinal and aromatic plants in India. Importance, origin, distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection, harvesting and processing of under mentioned important medicinal and aromatic plants. Storage techniques of essential oils. Crops: Clove, Nutmeg, Cinnamon and Tamarind —— Origin and distribution — Area and production — Composition and uses — Soil and climate — varieties — propagation — planting — irrigation - nutrition management - weed control —
mulching - mixed cropping, intercropping, multi-tier cropping - cover cropping - training and pruning practices - role of growth regulators- harvest and yield- GAP –Organic production of Tree Spices- post harvest technologies – processing storage – value added products –organic production – constraintProduction technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Aromatic Plants: Citronella grass, lavender, geranium, patchouli, occimum and other species relevant to the local conditions. Processing and value addition in MAPs produce.

Practical
Collection of Spices, medicinal and aromatic plants from their natural habitat and study their morphological description, nursery techniques, harvesting, curing and processing techniques and extraction of essential oils.

Text books

18HO1001 FUNDAMENTALS OF HORTICULTURE

Credits 2:0:1

Course Objectives
- To study the basics of horticulture and horticultural practices
- To expose the students to different horticulture divisions
- To impart knowledge on different types of plant propagation and propagating structures

Course Outcome
- Basics of horticulture and classification of crops learned
- Different types of plant propagation techniques and propagating structures studied
- Gain practical knowledge in Special horticultural practices

Theory

Practical
Features of orchard, planning and layout of orchard, tools and implements, identification of various horticultural crops, layout of nutrition garden, preparation of nursery beds for sowing of vegetable seeds, digging of pits for fruit plants, planting systems, training and pruning of orchard trees, preparation of
fertilizer mixtures and field application, preparation and application of growth regulators, layout of different irrigation systems, identification and management of nutritional disorder in fruits, assessment of bearing habits, maturity standards, harvesting, grading, packaging and storage, Visit to Private and Govt. nursery and orchard.

Text books

18HO1002 GROWTH AND DEVELOPMENT OF HORTICULTURAL CROPS
Credits 2:0:1

Course objectives
- To impart knowledge on basis of growth and development of horticultural crops
- To study the effects of factors responsible for physiological processes
- To learn physiological basis of horticultural practices

Course outcomes
- Gained knowledge on basis of growth and development of horticultural crops
- Students learnt the effects of factors responsible for physiological processes in horticultural crops
- Gained knowledge on physiological basis of horticultural practices

Theory
Growth and development-definitions, components, photosynthetic productivity, Canopy photosynthesis and productivity, leaf area index (LAI) - optimum LAI in horticultural crops, canopy development; different stages of growth, growth curves, Crop development and dynamics (Case studies of annual/perennial horticultural crops), growth analysis in horticultural crops. Plant bio-regulators- auxin, gibberellin, cytokinin, ethylene inhibitors and retardants, basic functions, biosynthesis, role in crop growth and development, propagation, flowering, fruit setting, fruit thinning, fruit development, fruit drop, and fruit ripening. Flowering-factors affecting flowering, physiology of flowering, photoperiodism-long day, short day and day neutral plants, vernalisation and its application in horticulture, pruning and training physiological basis of training and pruning-source and sink relationship, translocation of assimilates. Physiology of seed development and maturation, seed dormancy and bud dormancy, causes and breaking methods in horticultural crops. Physiology of fruit growth and development, fruit setting, factors affecting fruit set and development, physiology of ripening of fruits-climatic and non-climacteric fruits. Physiology of fruits under post-harvest storage.

Practical
Estimation of photosynthetic potential of horticultural crops, leaf area index, growth analysis parameters including harvest index, bioassay of plant hormones, identification of synthetic plant hormones and growth retardants, preparations of hormonal solution and induction of rooting in cuttings, ripening of fruits and control of flower and fruit drop. Important physiological disorders and their remedial measures in fruits and vegetables, seed dormancy, seed germination and breaking seed dormancy with chemicals and growth regulators.

Text books
18HO1003 PROPAGATION AND NURSERY MANAGEMENT FOR HORTICULTURAL CROPS

Credits 2:0:1

Course Objectives
- To impart skill oriented knowledge on media preparation and handling of tools for propagation
- To teach students on propagation methods
- To familiarize with the maintenance and after care of propagated plants

Course Outcome
- Students benefited with hands-on training in media preparation handling of tools for propagation
- Students learnt about mother plant selection and propagation techniques
- Students familiarized with the maintenance and after care of propagated plants

Theory

Practical

Text books

18HO1004 PRODUCTION TECHNOLOGY OF TROPICAL AND SUBTROPICAL FRUITS

Credits 2:0:1

Course Objective:
- To impart knowledge on basic cultural practices of Tropical and Subtropical Fruits crops
- To insist on modern techniques to increase the yield and production
- To learn about the special practices, harvesting and post-harvest handling of Tropical and Subtropical Fruits
Course Outcome:
- The student gains a thorough knowledge on basic production technology
- Familiarize on modern production techniques
- Acquaintance on special practices, harvesting and post-harvest handling

Theory
Horticultural classification of fruits including genome classification. Horticultural zones of India, detailed study of area, production and export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards. Post-harvest technology, harvest indices, harvesting methods, grading, packaging and storage of the following crops. Mango, banana, grapes, citrus, papaya, sapota, guava, pomegranate, bael, ber, amla, anona, fig, pineapple, jackfruit, avocado, mangosteen, litchi, carambola, durian, rambutan, bilimbi, loquat, rose apple breadfruit and passion fruit. Bearing in mango and citrus, causes and control measures of special production problems, alternate and irregular bearing overcome, control measures. Seediness and kokkan disease in banana, citrus decline and casual factors and their management. Bud forecasting in grapes, sex expression and seed production in papaya, latex extraction and crude papain production, economic of production.

Practical
Description and identification of varieties based on flower and fruit morphology in above crops. Training and pruning of grapes, mango, guava and citrus. Selection of site and planting system, pre-treatment of banana suckers, desuckering in banana, sex forms in papaya. Use of plastics in fruit production. Visit to commercial orchards and diagnosis of maladies. Manure and fertilizer application including bio-fertilizer in fruit crops, preparation and application of growth regulators in banana, grapes and mango. Seed production in papaya, latex extraction and preparation of crude papain. Ripening of fruits, grading and packaging, production economics for tropical and sub-tropical fruits. Mapping of arid and semi-arid zones of India. Botanical description and identification of ber, fig, jamun, pomegranate, carissa, phalsa, wood apple, West Indian cherry, tamarind, aonla, bael and anonna.

Text books

18HO1005 PRODUCTION TECHNOLOGY OF TROPICAL AND SUBTROPICAL VEGETABLES

Credits 2:0:1

Course Objective:
- To impart knowledge on basic cultural practices of vegetables crops.
- To insist on modern techniques to increase the yield and production.
- To learn about the economic estimation of commercial vegetable crops.

**Course Outcome:**
- The student gains a thorough knowledge on basic production technology.
- Familiarize on basic gardening techniques.
- Acquaintance on commercial oriented cultural practices.

**Theory**
Area, production, economic importance and export potential of tropical and sub-tropical vegetable crops. Description of varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly sown/transplanted vegetable crops. Spacing, planting systems, water and weed management; nutrient management and deficiencies, use of chemicals and growth regulators. Cropping systems, harvest, yield, post-harvest handling, economics and marketing of tropical and subtropical vegetable crops such as tomato, brinjal, chillies, capsicum, okra, amaranthus, cluster beans, cowpea, lab-lab, snap bean, cucurbits, moringa, curry leaf, portulaca, basella, sorrel and roselle.

**Practical**
Identification and description of tropical and sub-tropical vegetable crops; nursery practices and transplanting, preparation of field and sowing/planting for direct sown and planted vegetable crops. Herbicide use in vegetable culture; top dressing of fertilizers and intercultural; use of growth regulators; identification of nutrient deficiencies. Physiological disorder. Harvest indices and maturity standards, post-harvest handling and storage, marketing, seed extraction (cost of cultivation for tropical and sub-tropical vegetable crops), project preparation for commercial cultivation.

**Text book**

**18HO1006 IRRIGATION AND WEED MANAGEMENT IN HORTICULTURAL CROPS**

**Credits 2:0:1**

**Course objectives**
- To study soil, water and plant relationships and soil moisture constant with special reference to horticultural plants
- To introduce the concepts of water requirement of horticultural crops and its irrigation management
- To study the importance of weeds its classification and management with reference to horticultural plants

**Course objectives**
- Students gained practical knowledge on surface irrigation, pressurized irrigation, micro irrigation and fertigation
- Students learnt the layout of micro irrigation (Drip irrigation) to the horticultural crops
- Students gained knowledge on the principles of integrated weed management with special reference to horticultural plants
Agriculture

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 and horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

Practical
Measurements of irrigation water by using water measuring devices, use of common formula in irrigation practices, practicing of land leveling and land shaping implements, layout for different methods of irrigation. Estimation of soil moisture constants and soil moisture by using different, methods and instruments, scheduling of irrigation, different approaches, practicing use of instruments, estimation of irrigation efficiency and water requirements of horticultural crops, irrigation planning and scheduling, soil moisture conservation practices. Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of herbarium of weeds; Calculations on weed control efficiency and weed index; 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; Tours and visits of problem areas.

Text books

18HO2001 COMMERCIAL FLORICULTURE

Credits 2:0:1

Course objectives
- To educate students on commercial flower crops and their market thrust.
- To know about production technology of looseand cut flowers.
- To know about harvesting and post-harvest handling of loose and cut flowers.
- To know about concrete and other floral extraction methods.

Course outcomes
- Understand the production technology of commercial flowers
Understanding the harvesting and post-harvest handling of loose and cut flowers

Equipped for entrepreneurship in commercial floriculture

**Theory**

Scope and importance of commercial floriculture in India, production techniques of commercial flower crops like rose, marigold, chrysanthemum, orchid, carnation, gladiolus, jasmine, crossandra, anthurium, dahlia, tuberose, bird of paradise, china aster and gerbera for domestic and export market, production techniques of flowers and foliage filler materials growing of flowers under protected environments such as glass house, plastic house etc., postharvest technology of cut flowers in respect of commercial flower crops, dehydration technique for drying of flowers, production techniques for bulbous.

**Practical**


**Reference books**


18HO2002 PRODUCTION TECHNOLOGY OF SPICES AND PLANTATION CROPS

**Credits**  2:0:1

**Course Objectives**

- To teach scope and importance of spices and plantation crops
- To impart knowledge on production technology of spices and plantation crops
- To impart knowledge on special horticultural practices, various processes and their uses

**Course Outcome**

- Scope and importance of spices and plantation crops learned
- Production technology of spices and plantation plants studied
- Gain practical knowledge on various processes and their commercial uses

**Theory**

Spices: History, scope and importance, Present status, area and production, uses, export potential and role in national economy. Classification, soil and climate, propagation-seed, vegetative and micro-propagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products, methods of extraction of essential oil and oleoresins. Economics of cultivation, role of Spice Board and Pepper. Export Promotion Council, institutions and research centers in R&D. Crops: Cardamom, pepper, betel
vine ginger, turmeric, clove, nutmeg, cinnamon, all spice, curry leaf, coriander, fenugreek, fennel, cumin, dill, celery, bishops weed, saffron, vanilla, thyme and rosemary.

Plantation crops: History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by products utilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micro-propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of coconut, arecanut, oil palm, palmyrah palm, cacao, cashew nut, coffee, tea, Date palm and rubber.

Practical
Spices: Identification of varieties: propagation, seed treatment – sowing; layout, planting; hoeing and earthing up; manuring and use of weedicides, training and pruning; fixing maturity standards, harvesting, curing, processing, grading and extraction of essential oils and oleoresins.

Plantation crops: Description and identification of coconut varieties, selection of coconut and arecanut mother palm and seed nut, planting of seed nuts in nursery, layout and planting of coconut, arecanut, oil palm, cashew nut, cacao gardens, manuring, irrigation; mulching, raising masonry nursery for palm, nursery management in cacao. Description and identification of species and varieties in coffee, harvesting, grading, pulping, fermenting, washing, drying and packing of coffee, seed berry collection, seed extraction, treatment and sowing of coffee, epicotyl, softwood, grafting and top working in cashew, working out the economics and project preparation for coconut, arecanut, oil palm, cashew nut, cacao, etc. Mother plant selection, preparation of cuttings and rooting of tea under specialized structure, training, centering, pruning, tipping and harvesting of tea. Visit to commercial plantations.

Textbooks

18HO2003 PRECISION FARMING AND PROTECTED CULTIVATION

Credits 2:0:1

Course objectives
• To impart knowledge on the protected cultivation of vegetables, fruits and flower crops
• To sensitize the students on hi-tech production technology of fruits, vegetables and flower crops
• To learn about precision production technology for important horticultural crops

Course outcomes
• Gain knowledge on the protected cultivation of vegetables, fruits and flower crops
• Gain practical knowledge on hi-tech production technology of fruits, vegetables and flower crops
• Learn about precision production technology for important horticultural crops

Theory
Precision farming – laser leveling, mechanized direct seed sowing; seedling and sapling transplanting, mapping of soils and plant attributes, site specific input application, weed management, insect pests and disease management, yield mapping in horticultural crops. Green house technology, Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses,

**Practical**
Study of different types of greenhouses 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 fertigation requirements for greenhouses crops and estimation of E.C. in the fertigation solution; The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization; Visit to commercial greenhouses; Economics of protected cultivation.

**Reference books**

**18HO2004 DISEASES OF FRUIT, PLANTATION, MEDICINAL AND AROMATIC CROPS**

**Credits** 2:0:1

**Course objectives**
- To study about Etiology, symptoms, mode of spread and survival of diseases
- To study the symptoms of major diseases and host parasite relationship
- To impart knowledge on integrated management of important diseases of fruit, Plantation, Medicinal and Aromatic Crops

**Course outcomes**
- Learnt about Etiology, symptoms, mode of spread and survival of diseases
- Gain knowledge of symptoms of major diseases and host parasite relationship
- Learnt about integrated management of important diseases of fruit, Plantation, Medicinal and Aromatic Crops

**Theory**
Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of fruits, plantation, medicinal and aromatic crops viz mango, banana, grape, citrus, guava, sapota, papaya, jack fruit, pineapple, pomegranate, ber, apple, pear, peach, plum, almond, walnut, strawberry, areca nut, coconut, oil palm, coffee, tea, cocoa, cashew, rubber, betel vine senna, neem, hemp, belladonna, pyrethrum, camphor, costus, crotalaria, datura, dioscorea, mint, opium, Solanum khasianum and Tephrosia. Important post-harvest diseases of fruit, plantation and medicinal and aromatic crops and their management.

**Practical**
Observations of disease symptoms, identification of casual organisms and host parasite relationship of important diseases. Examination of scrapings and cultures of important pathogens of fruits, plantation, medicinal and aromatic crops.

**Reference books**

**18HO2005 SOIL FERTILITY AND NUTRIENT MANAGEMENT**

**Credits** 1:0:1

**Course Objectives:**
1. To study the role of nutrients in horticultural crop production
2. To learn the soil fertility evaluation and soil testing methods
3. To familiarize the concept and management of INM

**Course Outcome:**
1. Studied the role of nutrients in horticultural crop production
2. Learnt the soil fertility evaluation and soil testing methods
3. Familiarized the concept and management of INM

**Theory**

**Practical**

**Text books**

**18HO2006 PRODUCTION TECHNOLOGY OF TEMPERATE VEGETABLE CROPS**

**Credits** 1:0:1

**Course objectives**
- To familiarize the students about the scenario of temperate vegetable crops cultivation
- To know about advanced production technologies of temperate vegetable crops
- To learn about post-harvest handling of temperate vegetable crops
Course outcomes

- Scope and importance of temperate vegetable crops learned
- Advance production technology of temperate vegetable crops studied
- Gain practical knowledge on post-harvest handling of temperate vegetable crops

Theory

Importance of cool season vegetable crops in nutrition and national economy. Area, production, export potential, description of varieties and hybrids, origin, climate and soil, production technologies, post-harvest technology and Marketing of cabbage, cauliflower, knolkhil, sprouting broccoli, Brussels’ sprout, lettuce, palak, Chinese cabbage, spinach, garlic, onion, leek, radish, carrot, turnip, beet root, peas, broad beans, rhubarb, asparagus, globe artichoke, Vegetable kale.

Practical

Identification and description of varieties/hybrids; propagation methods, nursery management; preparation of field, sowing/transplanting; identification of physiological and nutritional disorders and their corrections; post-harvest handling; cost of cultivation and field visits to commercial farms.

Text books


18HO2007 PRODUCTION TECHNOLOGY OF TEMPERATE FRUIT CROPS

Credits: 0:1

Course Objectives

- To know the scenario and scope of temperate fruit crops
- To impart knowledge about the cultivation aspects of temperate fruit crops
- To study the different horticultural practices in cultivation of temperate fruit crops

Course Outcome

- Scope and Importance of temperate fruit crops learnt
- Practical knowledge on the cultivation aspects of temperate fruit crops
- Studied different horticultural practices in cultivation of temperate fruit crops

Theory

Classification of temperate fruits, detailed study of areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning, self-incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest handling and storage of apple, pear, peach, apricot, plum, cherry, persimmon, strawberry, kiwi, Queens land nut (Mecademia nut), almond, walnut, pecan nut, hazel nut and chest nut. Re-plant problem, rejuvenation and special production problems like pre-mature leaf fall, physiological disorders, important insect – pests and diseases and their control measures. Special production problems like alternate bearing problem and their remedies.

Practical

Nursery management practices, description and identification of varieties of above crops, manuring and fertilization, planting systems, preparation and use of growth regulators, training and pruning in apple, pear, plum, peach and nut crops. Visit to private orchards to diagnose maladies. Working out economics for apple, pear, plum and peach.
Text books

18HO2008 PRODUCTION TECHNOLOGY OF MEDICINAL AND AROMATIC CROPS
Credits 2:0:1

Course Objectives
- To learn scope and importance of medicinal and aromatic crops
- To study about production technology of medicinal and aromatic plants
- To impart knowledge on various processes, essential oil and their commercial uses

Course Outcome
- Scope and importance of medicinal and aromatic crops learned
- Production technology of medicinal and aromatic plants studied
- Gain practical knowledge various processes, essential oil and their uses of medicinal and aromatic plants

Theory
History, scope, opportunities and constraints in the cultivation and maintenance of medicinal and aromatic plants in India. Importance, origin, distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection, harvesting and processing of under mentioned important medicinal and aromatic plants. Study of chemical composition of a few important medicinal and aromatic plants, extraction, use and economics of drugs and essential oils in medicinal and aromatic plants. Therapeutic and pharmaceutical uses of important species. Storage techniques of essential oils. Medicinal Plants: Withania, periwinkle, Rauvolfia, Dioscorea, Isabgol, opium poppy Ammimajus, Belladonna, Cinchona, Pyrethrum and other species relevant to local conditions. Aromatic Plants: Citronella grass, khus grass, flag (baje), lavender, geranium, patchouli, bursera, menthe, musk, occimum and other species relevant to the local conditions. Marketing.

Practical
Collection of medicinal and aromatic plants from their natural habitat and study their morphological description, nursery techniques, harvesting, curing and processing techniques and extraction of essential oils.

Text books

18HO2009 BREEDING OF VEGETABLES, MEDICINAL AND AROMATIC CROPS
Credits 3:0:1

Course objective
- To study the basics of floral biology of Vegetables, Medicinal and Aromatic crops
- To gain knowledge on pollination mechanism, breeding strategies in Vegetables, Medicinal and Aromatic crops
To learn about methods of breeding and achievements in crop improvement of Vegetables, Medicinal and Aromatic crops

Course outcome

- To learnt basics of floral biology of Vegetables, Medicinal and Aromatic crops
- Practical knowledge gained on pollination mechanism, breeding strategies in Vegetables, Medicinal and Aromatic crops
- Learnt about methods of breeding and achievements in crop improvement of Vegetables, Medicinal and Aromatic crops

Theory


Practical

Floral biology and pollination mechanism in self and cross pollinated vegetables, tuber crops and spices. Working out phenotypic and genotypic heritability, genetic advance. GCA, SCA, combining ability, heterosis, heterobeltosis, standard heterosis, GxE interactions (stability analysis) Preparation and uses of chemical and physical mutagens. Polyploidy breeding and chromosomal studies. Techniques of F1 hybrid seed production. Maintenance of breeding records.

Text Books


18HO2010 DISEASES OF VEGETABLES, FLOWERS, ORNAMENTAL AND SPICE CROPS

Credits 2:0:1

Course Objectives:

- To impart knowledge on diseases of vegetables, flowers, ornamental and spice crops
- To make the student understand the symptoms and their spread
- To learn basics of plant disease management

Course Outcome:

- Able to know and understand diseases of vegetables, flowers, ornamental and spice crops and losses
- Knowledge on symptoms and their mode of spread will be imparted
- Plant disease management will be studied

Theory

Etiology, symptoms, mode of spread, epidemiology and integrated management of diseases of the following vegetables, ornamental and spice crops: tomato, brinjal, chilli, bhindi, cabbage, cauliflower, radish, knol-khol, pea, beans, beet root, onion, garlic, fenugreek, ginger, potato, turmeric, pepper, cumin,
cardamom, nutmeg, coriander, clove, cinnamon, jasmine, rose, crossandra, tuberose, gerebera, anthurium, geranium. Important post-harvest diseases of vegetables and ornamental crops and their management.

Practical
Observations of symptoms, causal organisms and host parasitic relationship of important diseases, examination of cultures of important pathogens of vegetables, ornamental and spice crops in field as well as in protected cultivation.

Reference books
1. Srikant Kulkarni, Yashoda R. Hedge. Diseases of Plantation crops and their management-, Agrotech publication Academy

18HO2011 INSECT PESTS OF FRUIT, PLANTATION, MEDICINAL & AROMATIC CROPS
Credits 2:0:1

Course objective
- To learn about Insect Ecology and factors responsible for outbreaks
- To study on methods of pest control in Fruit, Plantation, Medicinal & Aromatic crops
- To learn about integrated pest management of Fruit, Plantation, Medicinal & Aromatic crops

Course outcome
- Learnt about Insect Ecology and factors responsible for outbreaks
- Practical knowledge on methods of pest control in Fruit, Plantation, Medicinal & Aromatic crops
- Gain knowledge on integrated pest management of Fruit, Plantation, Medicinal & Aromatic crops

Theory
General – economic classification of insects; Bio-ecology and insect-pest management with reference to fruit, plantation, medicinal and aromatic crops; pest surveillance. Distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting tropical, sub-tropical and temperate fruits, plantation, medicinal and aromatic crops like coconut, areca nut, oil palm, cashew, cacao, tea, coffee, cinchona, rubber, betel vine senna, neem, belladonna, pyrethrum, costus, crotalaria, datura, Dioscorea, mint, opium, Solanum khasianum and. Storage insects – distribution, host range, bio-ecology, injury, integrated management of important insect pests attacking stored fruits, plantation, medicinal and aromatic crops and their processed products. Insecticide residue problems in fruit, plantation, medicinal and aromatic crops and their maximum residue limits (MRLs).

Practical
Study of symptoms of damage, collection, identification, preservation, assessment of damage and population of important insect – pests affecting fruits, plantation, medicinal and aromatic crops in field and storage.
Text Books

18AT2001 FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS
Credits 3:0:1

Objectives
- To understand the basic principles, fundamental concepts and theories of fluid mechanics
- To impart knowledge on static, kinematics and dynamic aspects of fluids
- To learn the losses occurring in fluid flow and flow measurements

Outcomes
- The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- They will also gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.
- The students will be able to apply their knowledge on design and measurement of irrigation channels

Theory
Properties of fluids, Pressure and its measurement, Pascal’s law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, meta centre and meta centric height, condition of floatation and stability of submerged and floating bodies; Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion; Dynamics of fluid flow, Bernoulli’s theorem, venturimeter, orifice meter and nozzle, siphon; Laminar and turbulent flow in pipes, general equation for head loss Darcy equation, Moody’s diagram, Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient; Flow through orifices, Flow through Mouthpieces, Notches, Weirs, Chezy’s formula for loss of head in pipes, Flow through simple and compound pipes, Open channel design and hydraulics: Chezy’s formula, Bazin’s formula, Kutter’s Manning’s formula, Velocity and Pressure profiles in open channels, Hydraulic jump; Dimensional analysis and similitude: Rayleigh’s method and Buckingham’s ‘Pi’ theorem, types of similarities, dimensional analysis, dimensionless numbers.

Practical
1. Verification of Bernoulli’s theorem
2. Measurement of discharge with a venturimeter
3. Measurement of velocity with a pilot tube
4. Determination of coefficient of discharge of rectangular weir
5. Determination of coefficient of discharge of triangular weir
6. Determination of coefficient of discharge of trapezoidal weir
7. Determination of hydraulic coefficient of orifices
8. Experiment on broad crested weir
9. Determination of head losses in pipes
10. Experiments on open channels
11. Determination of roughness coefficients of open channels
12. Measurement of velocity and pressure profiles in open channels

Text Books

**Reference Books**

**18AT2002 ENGINEERING PROPERTIES OF BIOLOGICAL MATERIALS AND FOOD QUALITY**

**Credits 2:0:0**

**Objectives**
- To acquaint and equip the students with different engineering properties of biological materials.
- To learn the flow behavior of food materials.
- To impart knowledge on the application in design of food processing equipments.

**Outcomes**
- The students will get a basic knowledge of the various properties of solid and liquid food materials.
- They will also gain the knowledge in addressing problems in the bio material conveying systems.
- The students will be able to apply their knowledge on design equipments.

**Theory**
Classification and importance of engineering properties of Agricultural produce, shape, size, roundness, sphericity, volume, density, porosity, specific gravity, surface area of grains, fruits and vegetables, Thermal properties; Co-efficient of thermal expansion, Friction in agricultural materials; Static friction, Kinetic friction, rolling resistance, angle of internal friction, angle of repose, Flow of bulk granular materials, Aero dynamics of agricultural products, drag coefficients, terminal velocity. Rheological properties; force, deformation, stress, strain, elastic, plastic and viscous behaviour, Newtonian and Non-Newtonian liquid, Visco-elasticity, Newtonian and Non-Newtonian fluid, Pseudo-plastic, Dilatant, Thixotropic, Rheopectic and Bingham Plastic Foods, Flow curves. Electrical properties; dielectric loss factor, loss tangent, conductivity and dielectric constant, method of determination. Application of engineering properties in handling processing machines and storage structures

**Text Books**

**Reference Books**

**18AT2003 POST-HARVEST ENGINEERING OF CEREALS, PULSES AND OILSEEDS**

**Credits 2:0:0**

**Objectives**
- To equip the students with various post harvest techniques of food materials.
- To acquire basic concept of various unit operation in processing.
- To impart knowledge on the processing of a wide range of food products.

**Outcomes**
- The students will get a basic knowledge on post harvest techniques material handling equipments.
- They will also gain the knowledge in addressing problems in post harvest engineering of food grains.
- The students will be able to apply their knowledge on selection of equipments for various unit operations.

**Theory**

**Text Books**

**Reference Books**
2. Geankoplis C. J. Transport processes and unit operations, Prentice Hall of India Pvt Ltd, New Delhi

18AT2004 FARM MACHINERY AND EQUIPMENT-I

**Credits 2:0:1**

**Objectives**
- To expose the students to farm mechanization benefits and constraints.
- To equip the students in the identification of components of implements.
- To impart knowledge on the working principles of farm equipments, tillage implements.

**Outcomes**
- The students will be able to understand the mechanization in agricultural farms.
- The students will gain knowledge on the various equipment used in the farm for different field operations.
- The students will be able to apply their knowledge on selection of equipments for various operations.

**Theory**
Introduction to farm mechanization, Classification of farm machines. Unit operations in crop production. Identification and selection of machines for various operations on the farm. Hitching systems and controls

Practical
1. Familiarization with different farm implements and tools.
2. Study of hitching systems.
3. Problems on machinery management.
4. Study of primary and secondary tillage machinery – construction, operation, adjustments and calculations of power and draft requirements.
5. Study of sowing and planting equipment – construction, types, calculation for calibration and adjustments.
6. Study of transplanters – paddy, vegetable, etc.
7. Identification of materials of construction in agricultural machinery and study of material properties.
8. Study of heat treatment processes subjected to critical components of agricultural machinery.

Text Books

Reference Books

18AT2005 TRACTOR SYSTEMS AND CONTROLS

Credits 2:0:0

Objectives
• To equip the student with sufficient knowledge about tractor and its various systems, their principles of operation and types, components etc.
• To impart knowledge on the concept of traction and mechanics of tractor.
• To introduce the ergonomic and safety considerations in tractors; and tractor testing.

Outcomes
• The students will be able to understand the various components of tractors.
• The students will have the knowledge on earth moving machineries and tractor classification and tillage implements.
• The students will acquire knowledge on the controls and trouble shooting of farm tractors.

Theory

Text Books

Reference Books
2. Relevant BIS Test Codes for Tractors.

18AT2006 FARM MACHINERY AND EQUIPMENT-II

Credits 2:0:1

Objectives
- To expose the students to farm mechanization benefits and constraints.
- To equip the students in the identification of components of implements.
- To impart knowledge on the working principles of farm equipments during field operations.

Outcomes
- The students will be able to understand the mechanization in agricultural farms.
- The students will gain knowledge on the various equipment used in the farm for different field operations.
- The students will be able to apply their knowledge on selection of equipments for various operations.

Theory

Practical
1. Familiarization with plant protection and interculture equipment.
2. Study of sprayers, types, functional components.
4. Calculations for chemical application rates.
5. Study of nozzle types and spread pattern using patternator.
7. Study of fertilizer application equipment including manure spreaders and fertilizer broadcasters.
8. Study of various types of mowers, reaper, reaper binder.
9. Familiarization with threshing systems, cleaning systems in threshers.
11. Familiarization with functional units of Grain combines and their types.
12. Calculations for grain losses in a combine.
13. Study of root crop diggers and familiarization with the functional units and attachments. Familiarization with the working of cotton and maize harvesters.
14. Familiarization with vegetable and fruit harvesters.

Text Books

Reference Books

18AT2007 FIELD OPERATION AND MAINTENANCE OF TRACTORS AND FARM MACHINERY

Credits 0:0:2

Objectives
- To familiarize the students with agricultural tractors and power tillers, its systems, operation, maintenance and safety precautions.
- To explain the application of different farm machinery in the field on tillage, sowing, plant protection, harvesting and threshing.
• To impart skill and technical know-how on dismantling and reassembling, care, maintenance and safety of farm machines.

Outcomes
• The students will be able to understand the mechanization in agricultural farms.
• The students will gain knowledge on the operation of various equipment used in the farm for different field operations.
• The students will be able to apply their knowledge on selection of equipments for various operations.

Practical
1. Familiarization with different makes and models of agricultural tractors.
2. Identification of functional systems including fuels system, cooling system, transmission system, steering and hydraulic systems.
3. Study of maintenance points to be checked before starting a tractor.
4. Familiarization with controls on a tractor.
5. Safety rules and precautions to be observed while driving a tractor.
6. Driving practice of tractor.
7. Practice of operating a tillage tool (mould-board plough/ disc plough) and their adjustment in the field.
8. Study of field patterns while operating a tillage implement.
9. Hitching & De-hitching of mounted and trail type implement to the tractor.
10. Driving practice with a trail type trolley – forward and in reverse direction.
11. Introduction to tractor maintenance – precautionary and break-down maintenance.
12. Care and maintenance procedure of agricultural machinery during operation and off-season. Repair and maintenance of implements – adjustment of functional parameters in tillage implements.
13. Replacement of furrow openers and change of blades of rotavators.
15. Setting of agricultural machinery workshop.

Reference Manuals
3. Operators Manuals of Tractors.
4. Service manuals provided by manufacturers.

18AT2008 POST-HARVEST ENGINEERING OF HORTICULTURAL CROPS

Credits 2:0:0

Objectives
• To equip the students with processing and handling of fruits and vegetables.
• To understand the various unit operations involved in the processing of horticultural crops.
• To facilitate the utilization of various equipments used for the processing of fruits and vegetables.

Outcomes
• The students will be able to understand the various processes in post harvest technology of horticultural crops.
• The students will apply their knowledge on the operation of various processing equipments.
• The students will be able to apply their knowledge on selection of equipments for various operations.
Theory
Importance of processing of fruits and vegetables, spices, condiments and flowers. Characteristics and properties of horticultural crops important for processing. Peeling: Different peeling methods and devices (manual peeling, mechanical peeling, chemical peeling, and thermal peeling), Slicing of horticultural crops: equipment for slicing, shredding, crushing, chopping, juice extraction, etc., Blanching: Importance and objectives; blanching methods, effects on food, Chilling and freezing: Application of refrigeration in different perishable food products, Thermophilic, mesophilic & Psychrophilic micro-organisms, Chilling requirements of different fruits and vegetables, Freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical & cryogenic), Effect on food during chilling and freezing, Cold storage heat load calculations and cold storage design, refrigerated vehicle and cold chain system, Dryers for fruits and vegetables, Osmo-dehydration, Packaging of horticultural commodities, Packaging requirements (in terms of light transmittance, heat, moisture and gas proof, micro organisms, mechanical strength), Different types of packaging materials used for raw and processed fruits and vegetables products, bulk and retail packages and packaging machines, handling and transportation of fruits and vegetables, Pack house technology, Minimal processing, Common methods of storage, Low temperature storage, evaporative cooled storage, Controlled atmospheric storage, Modified atmospheric packaging, Preservation Technology, General methods of preservation of fruits and vegetables, advantages and disadvantages of different physical/ chemical and other methods of preservation, Flowcharts for preparation of different finished products, equipment used for different unit operations, Quality control in fruit and vegetable processing industry.

Text Books

Reference Books

18AT2009 SOIL AND WATER CONSERVATION ENGINEERING

Credits 2:0:1

Objectives
- To present the concepts and causes of erosion and the problems associated with it.
- To enable the students to make use of the principles and concepts to solve issues related to soil and water management.
- To equip the students with proper application of different soil and water conservation measures to restore the productivity of the soil.

Outcomes
- The students will be able to gain fundamental knowledge on the concepts of erosion and sedimentation.
- They will have sufficient knowledge on soil and water conservation measures.
- The students will apply their knowledge on the design of various soil and water conservation measures.

Theory

**Practical**

1. Study of different types and forms of water erosion.
2. Exercises on computation of rainfall erosivity index.
4. Determination of length of slope (LS) and cropping practice (CP) factors for soil loss estimation by USLE and MUSLE.
5. Exercises on soil loss estimation/measuring techniques.
10. Design and layout of bench terraces.
11. Design of vegetative waterways.
12. Exercises on rate of sedimentation and storage loss in tanks.
14. Design of shelterbelts and wind breaks for wind erosion control.
15. Visit to soil erosion sites and watershed project areas for studying erosion control and water conservation measures.

**Text Books**


**Reference Books**

18AT2010 FUNDAMENTALS OF RENEWABLE ENERGY SOURCES

Credits 2:0:0

Objectives

- To make the student aware on the various basic aspects of energy use and its environmental impact.
- To introduce the different classifications of major renewable energy sources and technologies.
- To provide sufficient knowledge on alternate energy sources (solar energy and wind energy) and their applications.

Outcomes

- The students will attain fundamental knowledge on the concepts of bio energy sources and its applications.
- The students will be able to classify the various conventional and renewable energy sources.
- The students will be able to apply their knowledge on the design of solar and wind energy systems.


Text Books


Reference Books


18AT2011 EXTENSION METHODOLOGIES AND TRANSFER OF AGRICULTURAL TECHNOLOGY

Credits 2:0:0

Objectives

- To enable the learners of to understand the extension and basic communication skills.
- To impart knowledge about the transfer of technology using extension technologies.
- To provide skills on transferring technologies in the field.
Outcomes
- The students will attain the basic concepts of extension and basic communication skills.
- The students will gain knowledge about the transfer of technology using extension technologies.
- The students will be capable of transferring technologies in the field through effective extension methodologies.


Text Books

Reference Books

18AT2012 DAIRY AND FOOD ENGINEERING

Credits 2:0:1

Objectives
- To disseminate the knowledge of properties of products, unit operations and packaging involved in dairy and food engineering.
- To introduce the students to dairy industry, properties and processing of milk, manufacture of dairy products, sanitation and effluent treatment in dairy industry
- To expose the students to the fundamental knowledge of food, its properties and different methods of food processing

Outcomes
- The students will gain knowledge about Dairy and Food process engineering
- The students will understand the process of manufacturing of dairy products and thermal processing of food.
- The students will understand the importance of quality control and food preservation and packaging.

Theory
Deterioration in food products and their controls, Physical, chemical and biological methods of food preservation. Dairy development in India, Engineering, thermal and chemical properties of milk and milk products, Process flow charts for product manufacture, Unit operation of various dairy and food processing systems. Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, centrifugation and cream separation. Preparation methods and equipment for manufacture of cheese, paneer, butter and ice cream, Filling and packaging of milk and milk products;
Dairy plant design and layout, Plant utilities; Principles of operation and equipment for thermal processing, Canning, Aseptic processing, Evaporation of food products: principle, types of evaporators, steam economy, multiple effect evaporation, vapour recompression, Drying of liquid and perishable foods; principles of drying, spray drying, drum drying, freeze drying, Filtration: principle, types of filters; Membrane separation, RO, Nano-filtration, Ultra filtration and Macro-filtration, equipment and applications, Non-thermal and other alternate thermal processing in Food processing.

Practical
1. Study of pasteurizers.
2. Study of sterilizers.
3. Study of homogenizers.
4. Study of separators.
5. Study of butter churns.
7. Study of milk dryers.
8. Study of freezers.
10. Design of food processing plants & preparation of layout.
13. Visit to Food industry.

Text Books

Reference Books

18AT2013 STORAGE STRUCTURES AND PACKAGING TECHNOLOGY

Credits 2:0:1

Objectives
- To understand the underlying principles of spoilage and storage.
- To highlight the various standards and the environmental parameters involved in the design of such storage structures.
- To provide knowledge on different storage methods and packaging techniques for food materials.

Outcomes
- The students will have a clear understanding of various methods of storage and different packaging techniques for food.
- The students will be able to design proper storage structures for food grains.
- The students will have sufficient knowledge on various packaging materials and their manufacturing process.

Theory
Spoilage and storage- Direct damages, Indirect damages of perishable and durable commodities – control measures - factors affecting storage – types of storage – Losses in storage and estimation of losses. Storage methods- Improved storage methods for grain-modern storage structures-infestation-temperature and moisture changes in storage structures-CAP storage-CA storage of grains and perishables-construction operation and maintenance of CA storage facilities. Functions of packaging materials-

Practical
1. Design of shallow bins
2. Design of deep bins
3. Experiments with evaporative cold storage structure
4. Design of Cold Storage unit
5. Experiment on CA Storage for fruits
6. Experiment on CA Storage for grains
7. Testing of tensile Strength of packaging materials
8. MAP storage of fruits and vegetables
9. Experiment on Vacuum packaging of fruits and vegetables
10. Experiment on canning of fruits
11. Experiment on bottling of fruit products
12. Experiment on Form Fill Seal Machine for Liquids
13. Experiment on Form Fill Seal Machine for Powder foods
14. Visit to FCI godown
15. Visit to packaging Industry

Text Books

Reference Books

18AT2014 AGRICULTURAL WASTE AND BY-PRODUCTS UTILIZATION

Credits 2:0:0

Objectives
- To acquaint and equip the students with the proper utilization of agricultural waste and by-products.
- To understand the development of value added products from wastes.
- To identify suitable methods for the conversion of wastes into value added products.

Outcomes
- The students will acquire knowledge on the utilization of agricultural wastes.
The students will be able to design proper methods for conversion of wastes.
The students will find solutions for safe and efficient disposal and utilization of various agricultural wastes.

Theory
Types and formation of by-products and waste; Magnitude of waste generation in different food processing industries; Uses of different agricultural by-products from rice mill, sugarcane industry, oil mill etc., Concept, scope and maintenance of waste management and effluent treatment, Temperature, pH, Oxygen demands (BOD, COD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues, Waste utilization in various industries, furnaces and boilers run on agricultural wastes and byproducts, briquetting of biomass as fuel, production of charcoal briquette, generation of electricity using surplus biomass, producer gas generation and utilization, Waste treatment and disposal, design, construction, operation and management of institutional community and family size biogas plants, concept of vermin-composting, Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation, Secondary treatments: Biological and chemical oxygen demand for different food plant waste–trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons, Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal, Assessment, treatment and disposal of solid waste; and biogas generation, Effluent treatment plants, Environmental performance of food industry to comply with ISO-14001 standards.

Text Books

Reference Books

18AT2015 GROUND WATER, WELLS AND PUMPS

Credits 2:0:0

Objectives
• To equip the students with the occurrence, development and hydraulics of ground water flow.
• To understand the theories and application of wells and pumps.
• To impart knowledge in areas of well design, construction and management of wells.

Outcomes
• The students will know the technical aspects of groundwater, its availability, assessment and utilization.
The students will be familiarized with the theory behind well design.

The students will have the ability to construct and manage wells.

**Theory**

Occurrence and movement of ground water; aquifer and its types; classification of wells, fully penetrating tubewells and open wells, familiarization of various types of bore wells; design of open wells; groundwater exploration techniques; methods of drilling of wells: percussion, rotary, reverse rotary; design of tubewell and gravel pack, installation of well screen, completion and development of well; groundwater hydraulics-determination of aquifer parameters by different method(Theis, Jacob and Chow’s), Theis recovery method; well interference, multiple well systems, estimation of ground water potential, quality of ground water; artificial groundwater recharge techniques; pumping systems: water lifting devices; different types of pumps, classification of pumps, component parts of centrifugal pumps, priming, pump selection, installation and trouble shooting, performance curves, effect of speed on capacity, head and power, effect of change of impeller dimensions on performance characteristics; hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; deep well turbine pump and submersible pump.

**Text Books**


**Reference Books**


**18AT2016 WATER HARVESTING AND SOIL CONSERVATION STRUCTURES**

**Credits 2:0:1**

**Objectives**

- To familiarize the water harvesting techniques based on source, storage and use.
- To introduce the soil and water conservation structures.
- To impart awareness on the design requirements, planning for design, design procedures and stability analysis of different structures.

**Outcomes**

- The students will be able to gain fundamental knowledge on the concepts of water harvesting.
- The students will have sufficient knowledge on soil and water conservation measures.
- The students will be able to design various soil and water conservation structures.

**Theory**

disadvantages, straight apron and stilling basin outlet, structural components and functions. Loads on head wall, variables affecting equivalent fluid pressure, triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension. Chute spillway - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations. Drop inlet spillway - description, functional use and design criteria.

Practical
1. Study of different types of farm ponds.
2. Computation of storage capacity of embankment type of farm ponds.
3. Design of dugout farm ponds.
4. Design of percolation pond and nala bunds.
6. Exercise on energy dissipation in water flow.
7. Hydrologic, hydraulic and structural design of drop spillway and stability analysis.
8. Design of SAF stilling basins in chute spillway.
9. Hydrologic, hydraulic and structural design of drop inlet spillway.
11. Practice on softwares for design of soil and water conservation structures.
12. Field visit to watershed project areas treated with soil and water conservation measures / structures.

Text Books

Reference Books

18AT2017 BIO ENERGY SYSTEMS: DESIGN AND APPLICATIONS

Credits 2:0:1

Objectives
- To provide in depth knowledge on basic principles of Bio-energy systems.
- To impart the fundamental knowledge on the importance of Bio resources, Bio energy and reactors.
- To provide skills in design and operation of major bio-energy systems.

Outcomes
- The students will be able to understand the concepts of bio energy sources and its applications.
- The students will be able to find solutions for bio mass conversion into energy.
- The students will be able to apply their technical know-how for the design of bio energy systems.
Theory

Practical
1. Study of anaerobic fermentation system for industrial application.
2. Study of gasification for industrial process heat.
3. Study of biodiesel production unit.
4. Study of biomass densification technique (briquetting, pelletization, and cubing).
5. Integral bio energy system for industrial application.
7. Design of Bio energy systems.
8. Study and demonstration of energy efficiency in building.
9. Measuring efficiency of different insulation technique.
10. Study of Brayton, Stirling and Rankine cycles.
11. Study of modern greenhouse technologies.

Text Books

Reference Books

18AT2018 IRRIGATION AND DRAINAGE ENGINEERING
Credits 2:0:1

Objectives
- To develop competency to design water conveyance systems and surface irrigation systems in the field.
- To understand the basic concepts for planning, design and management of land drainage works in cultivated areas.
- To study the various methods of land drainage and its impact on environment

Outcomes
- The students will have technical knowledge and skills on Planning, design, operation and management of reservoir system.
• The students will gain knowledge on different methods of irrigation.
• The students will be able to design proper drainage systems in the field.

Theory

Practical
1. River basins, irrigation projects, irrigation tanks and water resources in TN.
2. Determination of soil moisture by different methods (gravimetric, tensiometer, gypsum block and neutron probe method).
4. Estimation of water requirement by different methods.
5. Estimation of Evapotranspiration.
6. Land levelling - plane method from climatologically data.
7. Determination of irrigation efficiencies.
8. Problems on Border irrigation and Design of Basin irrigation.
10. Problems on Kennedy’s and Lacey’s theory
11. Design of under ground pipeline system.
13. OFD works in command areas.
14. Design of surface drainage system.
15. Design of Sub-surface drainage system.
16. Field visit to command areas and observation of OFD works.

Text Books

Reference Books
18AT2019 MICRO IRRIGATION

Credits 2:0:1

Objectives
- To expose the students to the fundamental knowledge in Pumps for Irrigation use
- To understand the basic concepts for planning, design and management of micro irrigation system.
- To study the implementation of design in field level.

Outcomes
- The students will have technical knowledge and skills on Planning, design, operation and management of micro irrigation system.
- The students will gain knowledge on different methods of micro irrigation.
- The students will be able to design proper micro irrigation systems in the field.

Theory

Practical
1. Study of different components of sprinkler irrigation system, Design and installation of sprinkler irrigation system
2. Determination of precipitation pattern, discharge and uniformity coefficient ,Cost economics of sprinkler irrigation system
3. Study of different components of drip irrigation, Design and installation of drip irrigation system
4. Study of different types of filters, Determination of filtration efficiency
5. Determination of rate of injection and calibration for chemigation/fertigation
6. Design of irrigation and fertigation schedule for crops
7. Evaluation of drip system, Determination of pressure discharge relationship and emission uniformity for given emitter, Cost economics of drip irrigation system.
8. Field visit to micro- irrigation system

Text Books

Reference Books

18AT2020 PROCESS ENGINEERING FOR SPICES AND PLANTATION CROPS

Credits 2:0:0

Objectives
- To equip the students with processing spices and plantation crops.
- To understand the various processing steps involved for different plantation products, spices and aromatic and medicinal plants.
- To facilitate the utilization of various equipments used for processing.

Outcomes
- The students will be able to understand the various processes involved in the processing of spices and plantation crops.
- The students will apply their knowledge on the operation of various processing equipments.
- The students will be able to select proper equipments for various operations.


Text books

Reference books
18AT2021 APPLICATION OF RS AND GIS IN AGRICULTURE

Credits 2:0:0

Objectives
- To provide exposure to students in gaining knowledge on concepts and applications using Remote Sensing, GIS and GPS technologies.
- To acquire skills in storing, managing digital data for planning and development.
- To study the applications of Remote Sensing and GIS in agriculture, soil and water resources.

Outcomes
- The students will understand the remote sensing principles, remote sensing systems satellite data processing and available data products.
- The students will understand decision making process using DBMS and utilization of these advanced techniques in addressing the real world problems.
- The students will apply their skills on RS and GIS in agriculture, soil and water resources.

Basic component of remote sensing (RS), advantages and limitations of RS, possible use of RS techniques in assessment and monitoring of land and water resources; electromagnetic spectrum, energy interactions in the atmosphere and with the Earth’s surface; major atmospheric windows; principal applications of different wavelength regions; typical spectral reflectance curve for vegetation, soil and water; spectral signatures; different types of sensors and platforms; contrast ratio and possible causes of low contrast; aerial photography; types of aerial photographs, scale of aerial photographs, planning aerial photography- end lap and side lap; stereoscopic vision, requirements of stereoscopic photographs; air-photo interpretation- interpretation elements; photogrammetry- measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method; ground control for aerial photography; satellite remote sensing, multispectral scanner- whiskbroom and pushbroom scanner; different types of resolutions; analysis of digital data- image restoration; image enhancement; information extraction, image classification, unsupervised classification, supervised classification, important consideration in the identification of training areas, vegetation indices; microwave remote sensing. GI Sand basic components, different sources of spatial data, basic spatial entities, major components of spatial data, Basic classes of map projections and their properties, Methods of data input into GIS, Data editing, spatial data models and structures, Attribute data management, integrating data (map overlay) in GIS, Application of remote sensing and GIS for the management of land and water resources.

Text Books

Reference Books

**18AT2022 PROCESS EQUIPMENT DESIGN**

**Credits 2:0:0**

**Objectives**
- To equip the students to study the design aspects of the food processing equipments.
- To understand the relationship between process design and safety.
- To acquire knowledge on computer aided design of equipments

**Outcomes**
- The students will understand the various design aspects of the food processing equipments.
- The students will be able to design the process equipments.
- The students will be able to evaluate performance of process equipments.

Introduction on process equipment design, Application of design engineering for processing equipments, Design parameters and general design procedure, Material specification, Types of material for process equipments, Design codes, Pressure vessel design, Design of cleaners. Design of tubular heat exchanger, shell and tube heat exchanger and plate heat exchanger, Design of belt conveyer, screw conveyer and bucket elevator, Design of dryers. Design of milling equipments. Optimization of design with respect to process efficiency, energy and cost, Computer Aided Design.

**Text Books**
1. Mahajani, V. V. and Umarji, S. B., Process equipmen
t design, Macmillan.
2. Bhattacharyya, B. C., Introduction to Chemical Equipment design, CBS Publishers and Distributors.

**Reference Books**

**18AT2023 DEVELOPMENT OF PROCESSED PRODUCTS**

**Credits 2:0:0**

**Objectives**
- To equip the students to study the various processes involved in the development of products.
- To understand the correct unit operation for each product.
- To acquire knowledge on selection of suitable equipments for product development.

**Outcomes**
- The students will understand various processes involved in the development of products.
- The students will be able to identify suitable unit operation for processed product.
- The students will be able to evaluate selection of suitable equipments for product development.

**Theory**
Process design, Process flow chart with mass and energy balance, Unit operations and equipments for processing, New product development, Technology for value added products from cereal, pulses and oil seeds, Milling, puffing, flaking, Roasting, Bakery products, snack food. Extruded products, oil extraction and refining, Technology for value added products from fruits, vegetables and spices, Canned foods, Frozen foods, dried and fried foods, Fruit juices, Sauce, Sugar based confection, Candy, Fermented food
product, spice extracts, Technology for animal produce processing, meat, poultry, fish, egg products, Health food, Nutra-ceuticals and functional food, Organic food.

**Text Books**


**Reference Books**


**18AT2024 FARM MACHINERY DESIGN AND PRODUCTION**

**Credits** 2:0:0  
**Objectives**
- To equip the students about the importance of various farm machinery.  
- To understand the design aspects of farm machinery and implements.  
- To gain expertise on the design and production of farm machinery.

**Outcomes**
- The students will understand the importance of various farm machinery.  
- The students will be able to understand the design aspects of farm machinery and implements.  
- The students will be able to design and evaluate farm machinery and implements.

Introduction to design parameters of agricultural machines & design procedure. Characteristics of farm machinery design. Research and development aspects of farm machinery. Design of standard power transmission components used in agricultural machines: mechanical & hydraulic units. Introduction to safety in power transmission. Application of design principles to the systems of selected farm machines. Critical appraisal in production of Agricultural Machinery; Advances in material used for agricultural machinery. Cutting tools including CNC tools and finishing tools. Advanced manufacturing techniques including powder metallurgy, EDM (Electro-Discharge Machining), Heat Treatment of steels including pack carburizing, shot pining process, etc. Limits, Fits & Tolerances, Jigs & Fixtures. Industrial lay-out planning, Quality production management. Reliability. Economics of process selection. Familiarization with Project Report.

**Text Books**


**Reference Books**

1. Narula V. Manufacturing process.  

**18AT2025 TRACTOR DESIGN AND TESTING**

**Credits** 2:0:0  
**Objectives**
- To acquaint the students about the various aspects of design of tractors.  
- To equip with the testing procedures.  
- To gain expertise on the design and testing of farm tractors.
Outcomes

- The students will gain knowledge on the various aspects of design of tractors.
- The students will be equipped with the testing procedures for tractors.
- The students will be able to design and test farm tractors.


Text Books

1. Liljedahl J B & Others. Tractors and Their Power Units.

Reference Books


18AT2026 MECHANICS OF TILLAGE AND TRACTION

Credits 2:0:0

Objectives

- To understand the basic concepts on the mechanics of tillage and traction.
- To develop knowledge on power requirement for tillage.
- To study the various parameters in tillage operation.

Outcomes

- The students will understand the basic concepts the mechanics of tillage and traction.
- The students will gain on power requirement for tillage.
- The students will understand various parameters in tillage operation.

Introduction to mechanics of tillage tools, engineering properties of soil, principles and concepts, stress strain relationship, design of tillage tools principles of soil cutting, design equation, force analysis, application of dimensional analysis in soil dynamics and traction prediction equation. Introduction to traction and mechanics, off road traction and mobility, traction model, traction improvement, tyre size, tyre lug geometry and their effects, tyre testing, soil compaction and plant growth, variability and application of GIS in soil dynamics.

Measurement of static and dynamic soil parameters related to tillage, soil parameters related to puddling and floatation, draft for passive rotary and oscillating tools, slip and sinkage under dry and wet soil conditions and load and fuel consumption for different farm operations; Weight transfer and tractor loading including placement and traction aids; Studies on tyres, tracks and treads under different conditions, and soil compaction and number of operations.

Text Books

2. Liljedahl JB and others. Tractor and Power Units.
18AT2027 ERGONOMICS, HUMAN ENGINEERING AND SAFETY IN AGRICULTURAL MACHINERY

Credits 2:0:0

Objectives
- To impart basic knowledge in Ergonomics by understanding the fundamental Concepts
- To acquaint and equip with the ergonomic aspects in the design of farm machinery for more output and safety of human beings.
- To understand the basic concepts on human engineering and safety.

Outcomes
- The students will understand the fundamental concepts ergonomics and human engineering.
- The students will gain on safety aspects of machinery.
- The students will apply their knowledge in manufacturing industry.

Theory
Importance of ergonomics and its application in agriculture; Energy liberation in human body; Assessment of energy expenditure- direct calorimetry, Indirect calorimetry- Assessment by oxygen consumption; Techniques of measuring oxygen consumption; Assessment by heart rate and calibration; Assessment by subjective rating of perceived effort- Overall discomfort score and BPDS; Basal metabolism and work metabolism; Assessment of work load; Assessment of Individual's maximal work capacity. Anthropometry; Anthropometric data and measurement techniques; Anthropometric dimensions and strength parameters; Causes of variability of anthropometric data; Analysis of anthropometric data and use of percentiles. Biomechanics of motion. Vibration- hand arm vibration and whole body vibration, physiological effects; Noise and its physiological effects. Human factors in system development – concept of systems; basic processes in system development; performance reliability, human performance;Metabolic system, human energy machine, Human metabolism and work; Energy liberation in human body; Energy for muscle work; Assessment of energy expenditure- direct calorimetry, Indirect calorimetry; Techniques of measuring oxygen consumption; Assessment of work load; Information input process, visual displays, major types and use of displays, auditory and factual displays. Speech communications.

Text Books

Reference Books

18AT2028 DRIP AND SPRINKLER IRRIGATION-DESIGN AND INSTALLATION

Credits 0:0:10

Objectives
- To understand the basic concepts on drip and sprinkler irrigation systems.
- To know the various components of drip and sprinkler irrigation systems.
- To acquire knowledge on the design and installation of drip and sprinkler irrigation systems.

Outcomes
- The students will understand the basic concepts on drip and sprinkler irrigation systems.
• The students will gain knowledge on the various components of drip and sprinkler irrigation systems.
• The students will be able to design and installation of drip and sprinkler irrigation systems.

Practical
Study of different components of sprinkler irrigation system; design and installation of sprinkler irrigation system; determination of precipitation pattern, discharge and uniformity coefficient; cost economics of sprinkler irrigation system; study of different components of drip irrigation; design and installation of drip irrigation system; determination of pressure discharge relationship and emission uniformity for given emitter; study of different types of filters and determination of filtration efficiency; determination of rate of injection and calibration for chemigation/fertigation; design of irrigation and fertigation schedule for crops; field visit to micro irrigation system and evaluation of drip system; cost economics of drip irrigation system.

Text Books

Reference Books

18AT2029 WATERSHED MANAGEMENT-CONCEPT AND STRATEGIES
Credits 0:0:10

Objectives
• To understand a comprehensive idea about watershed management.
• To know the various strategies for watershed management.
• To acquire knowledge on planning and execution of watershed management projects.

Outcomes
• The students will understand the basic concepts and ideas about watershed management.
• The students will gain knowledge on the various strategies for watershed management.
• The students will be capable of planning and execution of watershed management projects.

Practical
Text Books

Reference Books

18AT2030 PRECISION FARMING IN THE SEMI-ARID AND HUMID TROPICAL ZONES
Credits 0:0:10

Objectives
• To understand the technology of precision farming.
• To know the various system concepts in precision farming.
• To acquire knowledge on planning and execution precision farming techniques using modern techniques.

Outcomes
• The students will understand the basic concepts and technology of precision farming.
• The students will gain knowledge on the various system concepts in precision farming.
• The students will be capable of planning and execution of precision farming techniques.

Practical
Precision Agriculture – need and functional requirements. Familiarization with issues relating to natural resources. Familiarization with equipment for precision agriculture including sowing and planting machines, power sprayers, land clearing machines, laser guided land levellers, straw-chopper, straw-balers, grain combines, etc.
Introduction to GIS based precision agriculture and its applications. Introduction to sensors and application of sensors for data generation.
Database management. System concept. System approach in farm machinery management, problems on machinery selection, maintenance and scheduling of operations.
Application to PERT and CPM for machinery system management
Solving problems related to various capacities, pattern efficiency, system limitation, etc.
Problems related to cost analysis and inflation and problems related to selection of equipment, replacement, break-even analysis, time value of money etc.

Text Books
Reference Books

18AT2031 MINOR IRRIGATION AND COMMAND AREA DEVELOPMENT
Credits 0:0:10
Objectives
• To familiarize students about the basic concepts of Irrigation Management and command area development.
• To impart knowledge about the functioning of Irrigation projects and their performance aspects.
• To prepare the students on the activities of command area development and on farm irrigation activities.

Outcomes
• The students will understand the basic concepts of Irrigation Management and command area development.
• The students will gain knowledge about the functioning of Irrigation projects and their performance aspects.
• The students will be capable of planning and execution of command area development and on farm irrigation activities.

Practical
Factors affecting performance of irrigation projects; types of minor irrigation systems in India.
Lift irrigation systems: feasibility, type of pumping stations and their site selection, design of lift irrigation systems.
Tank Irrigation: grouping of tanks, storage capacity, supply works and sluices.
Command area development (CAD) programme - components, need, scope, and development approaches, historical perspective, command area development authorities-functions and responsibilities; on farm development works, reclamation works, use of remote sensing techniques for CAD works; water productivity: concepts and measures for enhancing water productivity; Farmers’ participation in command area development;
Preparation of command area development layout plan; Irrigation water requirement of crops; Preparation of irrigation schedules; Planning and layout of water conveyance system; design of surplus weir of tanks; determination of storage capacity of tanks; design of intake pipe and pump house.

Text Books

Reference Books

18AT2032 LANDSCAPE IRRIGATION DESIGN AND MANAGEMENT
Credits 0:0:10
Objectives
• To acquaint students about the basic concepts of landscape design.
• To impart knowledge about the design aspects of landscape.
To provide hands on experience on the design and implementation of landscape irrigation and management.

Outcomes
- The students will attain the basic concepts of landscape design.
- The students will gain knowledge about the design aspects of landscape.
- The students will be capable of designing and execution landscape irrigation and management.

Practical
Conventional method of landscape irrigation - hose irrigation system, quick release coupling system and portable sprinkler with hose pipes.
Modern methods of landscape irrigation - pop-up sprinklers, spray pop-up sprinkler, shrub adopter, drip irrigation and bubblers; Merits and demerits of conventional and modern irrigation systems.
Types of landscapes and suitability of different irrigation methods, water requirement for different landscapes, Segments of landscape irrigation systems, Main components of modern landscape irrigation systems and their selection criteria.
Types of pipes, pressure ratings, sizing and selection criteria.
Automation system for landscape irrigation - main components, types of controllers and their application.
Design of modern landscape irrigation systems, operation and maintenance of landscape irrigation systems.
Determination of power requirement, pump selection. Irrigation scheduling of landscapes, Study of irrigation controllers and other equipments.
Use of AutoCAD in irrigation design: blocks & symbols, head layout, zoning and valves layout, pipe sizing, Pressure calculations etc.
Visit to landscape irrigation system and its evaluation.

Text Books

18AT2033 AGRO PROCESSING INDUSTRY - DESIGN AND MANAGEMENT

Credits 0:0:10

Objectives
- To acquaint students about the basic design concepts of agro industry.
- To impart knowledge about the design aspects of processing industry.
- To provide technical know-how on the preparation of project reports.

Outcomes
- The students will attain the basic concepts of agro industry.
- The students will gain knowledge about the design aspects of processing industry.
- The students will be capable of preparing project reports for setting various processing units.

Practical
1. Preparation of project report.
2. Preparation of feasibility report.
3. Salient features and layout of pre processing house.
4. Salient features and layout of Milk and Milk product plants- Evaluation of given layout.
5. Salient features, design and layout of modern rice mill.
6. Salient features, design and layout of Bakery and related product plant.
7. Study of different types of records relating to production of a food plant.
8. Study of different types of records relating to finance of a food plant.
9. Study of different types of records relating to marketing of a food business.
10. Brain storming and SWOT analysis to start a food processing business.

Text Books
4. Maroulis Z B and Saravacos G D. Food plant economics. Taylor and Francis, LLC

Reference Books

18AT2034 FARM MACHINERY AND POWER

Credits 1:0:1

Objectives
- To enable the students to understand the various farm implements and equipments.
- To impart knowledge about the application of implements for various operations.
- To provide technical know-how on working of equipments.

Outcomes
- The students will understand the various farm machinery.
- The students will gain knowledge about the use of farm machines.
- The students will understand the working of on working of equipments.

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

Practical
1. Study of different components of I.C. engine.
2. Learning of tractor driving,
3. Familiarization with operation of power tiller.
4. Familiarization with different types of primary and secondary tillage implements
5. Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter
6. Familiarization with different types of sprayers and dusters
7. Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery.

Text Books
Reference Books

18AT2035 SOIL AND WATER CONSERVATION

Credits 1:0:1

Objectives
- To enable the students to understand the concept of soil and water conservation.
- To impart knowledge about the various causes for soil erosion.
- To provide technical know-how on soil and water conservation measures.

Outcomes
- The students will attain the basic concepts of soil and water conservation.
- The students will gain knowledge about the various causes for soil erosion and prevention methods.
- The students will understand the various soil and water conservation measures.

Theory

Practical
3. Preparation of contour maps.
4. Design of grassed water ways.
5. Design of contour bunds.
6. Design of graded bunds.
7. Design of bench terracing system.
8. Problem on wind erosion.

Text Books

Reference Books
18AT2036 SKILL DEVELOPMENT TRAINING-I (STUDENT READY)
Credits 0:0:5
Objective:
To train the students on skill development.

Summer break after IV semester - Student READY Skill Development Training -I for five weeks in the summer break after IV semester with a credit load of 0+5 credit hours.

18AT2037 10-WEEKS INDUSTRIAL ATTACHMENT/INTERNSHIP(STUDENT READY)
Credits 0:0:10

Objective:
To impart training in industries.
Semester VII - Industrial attachment of 10 weeks with local industries.

18AT2038 10-WEEKS EXPERIENTIAL LEARNING ON CAMPUS (STUDENT READY)
Credits 0:0:10

Objective:
To conduct trials in the field for onsite learning.

Semester VII - On campus Experiential Learning Program of 10 weeks with a credit load of 0+10 credit hours by selecting subjects given in the syllabus.

18AT2039 SKILL DEVELOPMENT TRAINING-II (STUDENT READY)
Credits 0:0:5

Objective:
To train the students on skill development.

Summer break after VI semester - Student READY Skill Development Training -II for five weeks in the summer break after VI semester

18AT2040 EDUCATIONAL TOUR
Credits 0:0:2

Objective:
To expose the various research organizations to gain on the field knowledge.

Visit to places of interest in Tamil Nadu & Pondicherry States related to the subjects taught in Farm Machinery and Power, soil and Water Conservation Engineering, Food and Agricultural Process Engineering, Bio Energy and Agricultural Structures, Viz.,

18AT2041 PROJECT PLANNING AND REPORT WRITING
Credits 0:0:10

Objective:
To prepare the student for project and field study of selected topic.

18AT2042 RENEWABLE ENERGY AND GREEN TECHNOLOGY

Credits 1:0:1

Objectives

- To enable the students to understand the concept of renewable energy.
- To impart knowledge about the various green technology techniques.
- To provide technical know-how on renewable energy measures.

Outcomes

- The students will gain the basic knowledge of renewable energy.
- The students will design renewable energy structures.
- The students will analyze the green energy techniques.

Theory

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

Practical

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

Text Books


Reference Books


18AT2043 PROTECTED CULTIVATION AND SECONDARY AGRICULTURE

Credits 1:0:1

Objectives

- To enable the students to know the basics of protected cultivation.
- To impart knowledge about the various techniques involved in protected cultivation.
- To provide technical know-how on secondary agriculture.

Outcomes

- The students will understand the basic concepts of protected cultivation.
The students will design improved protected cultivation measures.
The students will analyze cost economics in secondary agriculture.

Theory
Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis. Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical
Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

Text Books

Reference Books

18AT2044 WATER QUALITY AND MANAGEMENT MEASURES

Credits 2:0:0

Objectives
- To enable the students to know the basics of water and its quality.
- To impart knowledge about the various techniques involved in water quality testing.
- To provide technical know-how on managing water quality.

Outcomes
- The students will understand the basics of water quality.
- The students will find measures to solve water quality.
- The students will design methods to find solutions for water testing.

Theory
Natural factors affecting quality of surface water and groundwater, water quality objectives in relation to domestic, industrial and agricultural activities, drinking water quality standards, irrigation water quality classification as per USSL and All Indian Coordinated Research Project (AICRP) criteria, point and non-point water pollution sources, water contamination due to inorganic and organic compounds, water contamination related to agricultural chemicals, food industry, hydrocarbon and synthetic organic compounds. Arsenic and fluoride contamination in groundwater and remedial measures, water
decontamination technologies, cultural and management practices for using poor quality water for irrigation.

Text Books

Reference Books

18AT2045 BASICS OF MATLAB PROGRAMMING

Credits 2:0:0
Course objectives:
- To understand the fundamentals of MATLAB.
- To impart basic knowledge on simulation and modeling.
- To know the importance of dynamics and control.

Course outcomes:
- The students will understand the role of MATLAB programming.
- The students will study various methods of plotting.
- The students will compute solutions for various properties for various water and environmental problems.

Theory
Basic Matlab programming: algorithm, pseudo-code, flow chart, interface, data types- expressions, constants, variables, assignment statement, arrays-control statements: if, else, then, while, for loop, nested loop, switch/case- functions and scripts- formatted input and output statements-reading from and writing to a text file-sorting-basic plotting: 2D and 3D plots, figures and sub plots - graphics handling, objects-application examples in environmental and water resources engineering.

Text Books

Reference Books

18AT2046 FARM MECHANIZATION – FIELD STUDY

Credits 0:0:10
Objectives
- To impart basic knowledge in farm mechanization.
- To acquaint and equip with the farm machinery for different crops.
- To understand the economics of using agricultural machinery.
Outcomes
- The students will understand the various farm machinery used in farms.
- The students will gain knowledge on usage aspects of farm mechanization.
- The students will apply their knowledge in mechanization of the farm.

Practical
Familiarization with different farm implements and tools.
Problems on machinery management.
Study of primary and secondary tillage machinery – construction, operation, adjustments and calculations of power and draft requirements.
Study of sowing and planting equipment – construction, types, calculation for calibration and adjustments.
Study of transplanters – paddy, vegetable, etc.
Familiarization with plant protection and intercultural equipment.
Study of sprayers, types, functional components.
Study of dusters, types and functional components.
Study of various types of mowers, reaper, reaper binder.
Familiarization with threshing systems, cleaning systems in threshers.
Calculations of losses in threshers.
Familiarization with functional units of Grain combines and their types.

Text Books

Reference Books

18AT2047 TESTING OF FARM MACHINERY AND EQUIPMENTS

Credits 0:0:10

Objectives
- To impart basic knowledge in testing of farm machinery.
- To acquaint and equip the economics of farm equipments.
- To understand the methods of testing various farm machinery.

Outcomes
- The students will understand the various methods of testing.
- The students will gain knowledge on application of testing farm equipments.
- The students will apply their knowledge in farm machinery testing.

Practical
Text Books

Reference Books

18AT2048 VALUE ADDITION OF INDIGENOUS FRUITS AND VEGETABLES

Credits 0:0:10

Objectives
- To acquaint students about the basics of value addition of fruits and vegetables.
- To impart knowledge about methods of preserving fruits and vegetables.
- To provide technical know-how on the preparation of project reports for preservation techniques.

Outcomes
- The students will attain the basic concepts of value addition.
- The students will gain knowledge about the methods of processing indigenous fruits and vegetables.
- The students will be capable of preparing project reports for setting processing units for indigenous fruits and vegetables.

Practical
Selection of indigenous fruits and vegetables.
Study of their quality attributes.
Study of physical and chemical parameters.
Preparation of processing techniques.
Preparation of project reports for value addition.

Text Books

Reference Books
AGRICULTURE
### LIST OF COURSES

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#### 17AG1001 PRINCIPLES OF AGRONOMY AND AGRICULTURAL HERITAGE

**Credits:** 3:0:1

**Course Objectives:**
- To have a general understanding on the crops and their classification
- To apprise the student about planting of crops and application of fertilizers
- To familiarize the students with the traditional agricultural practices in the world

**Course outcome:**
- Basics of crop characteristics and classification understood
- Fundamentals of soil-water-plant relationship studied
- Best traditional practices learned

**Description:**

**Practical:**
References:
2. Patil, J.V. et. al., 2015, Key Notes on Agronomy, Daya Publishing House, Delhi

17AG1002 AGRICULTURAL MICROBIOLOGY

Credits: 3:0:1

Course Objectives:
- To learn about germ theory of the diseases
- To have a general understanding on soil microbiology
- To study the beneficial use of micro-organisms

Outcome:
- Germ theory studied
- Action of microbes in soils understood
- Beneficial use of microbes learned

Description:

Practical
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 slant and nutrient agar stabling; 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 -

References
1. Ram Chandra, 2015, Microbial Biodiversity in Sustainable Agriculture, Daya Publishing House, Delhi
2. Lakhman, H. C., 2015, Recent Trends in Microbiology Mycology and Plant Pathology, Daya Publishing House, Delhi

17AG1003 FUNDAMENTALS OF PLANT BIOCHEMISTRY

Credits: 3:0:1

Course Objectives:
- To impart knowledge on plant cells, proteins and biosynthesis
- To educate on the importance of proteins, enzymes and lipids
- To impart knowledge on biosynthesis

Course Outcome:
- Basic understanding imparted on plant cells, proteins, industrial applications and biosynthesis
- The students learnt the importance of plant cells
- Basics of protein enzymes and lipids understood
- Familiarized with the application of bio-molecules in industry

Description:

Practical
Amino acid models (atomic); Paper electrophoresis for the separation of plant pigments; Protein denaturation – heat, pH, precipitation of proteins with heavy metals, Protein estimation by Lowry method; Enzyme kinetics, competitive inhibition, enzyme41 immobilization; Extraction of nucleic acids, column chromatography of RNA hydrolysate; Characterization of lipids by T.L.C.; Extraction of oil from oil seeds; Estimation of fatty acids by G.L.C.; Models of sugars, sucrose and starch; Quantitative determination of sugars; Paper chromatography for the separation of sugars; Determination of phenols.

References
1. Dutcher, Raymond Adams et. al., 2014, Biotech Books, New Delhi

17AG1004 AGRICULTURAL METEOROLOGY

Credits: 3:0:1

Course Objectives:
- To understand the role of meteorology in plant science
- To learn climatic parameters and their measurements
- To study the fundamentals of global warming and climate change

Course Outcome:
- Agro-climatic factors understood
- Measurement and estimation techniques for climatic parameters learned
- Fundamentals of global warming and climate change studied

Description:

Practical:

References:

17AG1005 IRRIGATION WATER MANAGEMENT

Credits: 3:0:1

Course Objectives:
- To introduce soil-water-plant relationships in the context of irrigation
- To introduce the concepts of scheduling, water distribution, design and methods of irrigation
- To have practical knowledge on drip and sprinkler irrigation

Course Outcome:
- Students learnt estimation of crop water and irrigation requirements
- Students enabled in implementing irrigation schemes
- Students capacitated in selecting appropriate irrigation methods

Description:
Irrigation: need, importance, impact on development of humanity, development in India; National Water Policy and irrigation. Canal, tank irrigation. Crop water requirement of different crops; infiltration; soil-water-plant relationships; soil quality; Duty of water; supply and demand based water distribution; irrigation scheduling; frequency and interval of irrigation; Warabandhi system. Different irrigation methods: border irrigation, furrow irrigation, basin irrigation, drip and sprinkler irrigation; irrigation methods: consideration of slope, soils and climate, evaluation, wetting pattern and planting techniques, efficiency; case studies.

Practicals
Visit to farm and demonstration of basin, drip and sprinkler irrigation in the field; conducting pumping test; planning, design and estimation related to drip irrigation.

Reference
1. Lamm, Freddie R., et. al., 2013, Microirrigation for Crop Production: Design Operation and Management, Bio-Green Elsevier (Exc)

17AG1006 CROP PHYSIOLOGY

Credit 3:0:1

Course Objectives:
- To introduce the students to seed physiology and biochemical changes during seed development.
- To understand growth and growth characteristics
- To impart knowledge on basic nutriphysiology

Course Outcome:
- Knowledge gained on different aspects of seeds
- Study growth pattern of plants
- Learned nutriphysiology
Description:

Practicals:
Study of plant cells; Preparation of standard solutions; Structure and distribution of stomata, imbibition, osmosis and plasmolysis, measurement of root pressure, rate of transpiration; Separation of photosynthetic pigments through paper chromatography; Estimation of chlorophyll; Rate of transpiration; Photosynthesis, respiration, tissue test for mineral nutrients; Estimation of RWC; Measurement of rate of photosynthesis by IRGA; Estimation of hormone using bioassay.

References

17AG1007 PRINCIPLES OF GENETICS AND GENOMICS

Credits 3:0:1

Course Objectives:
- To impart knowledge on structure of genes and type of genes action
- To make the student understand chromosome, structure, morphology, number and types
- To learn basics of DNA, RNA and fundamentals of transcription, translation, genetic code and outline of protein synthesis

Course Outcome:
- Mendel’s laws and types of gene action studied
- Basics of DNA, RNA and fundamentals of transcription, translation, genetic code and protein synthesis learned, as also evolution of different crop species understand
- Chromosomal aberrations and evolutions of different crop species studied

Description:
Mendel’s laws of inheritance and exceptions to the laws. Types of gene action, Multiple alleles, Pleiotropism, Penetrance and expressivity; Quantitative traits and Qualitative traits. Multiple factor hypothesis: cytoplasmic inheritance – important features and difference from chromosomal inheritance. Mutation and it’s features; Methods of inducing mutations and CIB technique. Fine structure of gene; gene expression regulation and differential gene activation; Ultra structure of cell and cell organelles and their functions. Study of chromosome structure - morphology, number and types, Karyotype and Idiogram; Mitosis and meiosis - its significance and differences. DNA - its structure and function – types of DNA – modes ofreplication and repair. RNA - its structure, function and types; transcription, translation,genetic code and outline of protein synthesis. Linkage and crossing: types of linkage,over estimation of linkage; Numerical chromosomal aberrations (Polyploidy) andevolution of different crop species like cotton, wheat, tobacco, triticale and brassicas. Structural chromosomal aberrations.
Practicals:
Microscopy: Preparation and use of fixatives and stains for light microscopy; Preparation of micro slides and identification of various stages of mitosis and meiosis; Monohybrid ratio and its modifications; Dihybrid ratio and its modifications; Trihybrid ratio; Chi-square analysis, Interaction of factors; Epistatic factors, Supplementary factors and duplicate factors; complementary factors; additive factors and inhibitory factors.

References:
1. Singh, Upadhyaya Bisht, 2015, Genetic and Genomic Resources of Grain Legume Improvement, Elsevier-Biogreen

17AG1008 PRINCIPLES OF AGRICULTURAL ECONOMICS

Credits: 2:1:0

Course Objectives:
- To highlight the importance of agricultural economics
- To familiarize with different theories and laws in economics applicable to agriculture
- To learn the basics of public finance and welfare economics in relation to agriculture

Course Outcome:
- Basics of agricultural economics and fundamentals of welfare economics studied
- Theories and laws applicable to agriculture economics learned
- Gained knowledge on public finance and welfare economics in relation to agriculture

Description:
17AG1009 DIMENSIONS OF AGRICULTURAL EXTENSION

Credits: 2:0:1

Course Objective:
- To orient the students with the concept of extension education and its importance in agriculture development
- To expose the students with various rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis
- To make the students learn about the new innovations being brought into the Agricultural Extension in India

Course Outcome:
- Students learned the concepts of agricultural extension and rural development programs
- New innovations in the area of agricultural extension in India understood
- Gained practical knowledge on watershed development and self-help groups

Description:
Education: meaning, definition, types. Formal, Informal and Non-formal education and their characteristics.

Practicals:
Visits to a village and kisan mandal to study the ongoing development programmes. Visits to Panchayat Raj Institutions to study the functioning of Gram Panchayats (GP) and Zilla Praja Parishad (ZPP). Visit and study the District Rural Development Agency (DRDA). Participation in monthly workshops of Training and Visit (T&V) System. Visit to Watershed Development Project area. Visit to a village to study the Self Help Groups (SHGs) of DWCRA. Visit to a voluntary organization to study the developmental activities. Organizing PRA techniques in a village to identify the agricultural problems. Visit to villages.
Reference:
5. Singh A.K. et. al., 2015, Dynamics of Agricultural Extension Approaches, Biotech Books, New Delhi

17AG1010 PRINCIPLES OF HORTICULTURAL SCIENCES

Credits 3:0:1

Course Objectives:
- To teach fundamentals of horticulture and horticultural practices
- To impart knowledge on different types of plant propagation and also structures used in farms
- To expose the students to different horticulture vegetables, fruits, species, aromatic and medicinal crops

Course Outcome:
- Fundamentals of horticulture and classification of crops learned
- Different types of plant propagation techniques and structures used in the farm studied
- Gained practical knowledge in plant propagation and pest and disease control

Description:
Horticulture, vegetables, fruits, spices, aromatic and medicinal plants and floriculture, plantation crops, tuber crops, bamboo and mushroom - definition, evolution, art, science, vocation, hobby, etc. Importance, divisions, classification of crops; Commercial orchards, garden and plantations. Selection of site for crops - climate, soil, socio-economic factors; Orchard planning, layout, peg marking, planting systems, spacing, digging pits, age of planting materials, after care, inter cropping, mixed cropping, etc. Tree forms and functions training and pruning in horticultural crops, principles and methods. Techniques of training and pruning – root pruning, girdling, ringing, notching, smudging, and bending, thinning - chemical and mechanical. Phases of growth and development: vegetative / reproductive balance; flowering, bearing habit and its classification; Fruit set - carbon nitrogen relation, structure and process in relation to set and drop, factors affecting and measures to overcome drop; Problems of unfruitfulness - internal factors, external factors – measures to overcome; Seedlessness in horticultural crops - significance and induction; Plant growth regulators in horticulture - natural and synthetic regulators - preparation and methods of application; Plant propagation - definition and basic concepts, types - advantages and disadvantages; Potting and repotting - objectives and uses, containers and potting media/ mixture - kinds, qualities, pre-planting treatments; Propagation by seed - seed qualities, seed testing, seed germination - types of seed dormancy, presowing treatments – factors affecting germination. Asexual propagation - apomixis, polyembryony, plant modifications for vegetative propagation - bud sports, chimeras. Propagation by cuttings - types of cuttings - factors affecting rooting of cuttings. Propagation by layering - advantages and disadvantages -types of layering. Propagation by grafting - advantages and disadvantages, stock - scion relationships, incompatibility; Grafting and budding - methods - advantages and disadvantages - separation and after care; Plant propagating structures - green house/ glass house, hot bed, cold frame, lath house, net house, mist chamber; Nursery - site selection, lay-out, components, progeny orchards, sales unit, display area, management, maintenance, commercial propagation of selected horticultural plants; Micro propagation of horticultural plants - definition, principles, methods, advantages and disadvantages, field of application in horticultural crops.

Practicals
Practice in propagation of plants through seeds. Familiarization with media, implements and containers for plant propagation. Studies on seed testing, certification and storage. Practice in rootstock production, vegetative propagation methods – cutting, budding, grafting layering etc. separation of propagules. Use of growth regulators for plant propagation. Study of propagation through tissue culture. Studies on preparation of designs and estimates for establishment of plant propagation unit, plant growing structures and tissue culture unit. Identification of common pests and diseases in nursery plants and their control. Visit to different types of nurseries, selection of site and
layout– Familiarization with components of nurseries– handling, display and sales of plants – cultural practices –
Estimation of production costs for different kinds of planting materials. Practice of potting /bagging, re-potting etc.
Packing and transport of nursery materials. Practice in tissue culture laboratory. Registers to be maintained in a
commercial nursery. Visit to different nurseries (both government and private).

References:
2. Sharangi, Amit Baran, 2014, Seed Production of Selected Horticultural Crops, Regency Publications
3. Chavan, U. D. et. al., 2015, Key Notes on Horticulture and Agriculture Extension, Daya Publishing House, Delhi

17AG1011 INTRODUCTION TO SOIL SCIENCE

Credits: 3:0:1

Course Objectives:
- To highlight the physical properties of soils
- To understand soil-water interaction and thermal properties of soil
- To study the chemical and biological aspects of soil

Course Outcome:
- Students made familiar with the role of soils in agriculture
- Familiarized with physical, chemical, biological aspects of soil and soil-water-plant interaction
- Learned soil biology including the beneficial and harmful role of soil organism

Description:
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 and porosity – their significance and 
formations – characterization of soils of Tamil Nadu. 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 
- their genesis and sources of charges. Adsorption of ions - ion exchange - CEC and AEC - factors influencing ion 

Practical

References

17AT1001 INTRODUCTION TO AGRICULTURE

Credit: 2:0:0
Course Objectives:
- To introduce the scope of agriculture to engineering students
- To impart knowledge on soil-water-plant relationship
- To familiarize with plant growth and fertilizer application and irrigation

Course Outcome:
- Basics of agriculture science learned
- Soil-water-plant relationship learned
- Different stages of plant growth and application of fertilizers studied

Description:

References:
1. Sharma, Rakesh Kumar et. al., 2014, Basics of Agriculture for Engineers, Daya Publishing House, Delhi

17HO1001 BO TANY OF HORTICULTURAL CROPS

Credits: 3:0:0

Course Objectives:
- To teach the fundamentals of botany of the horticultural crops
- To expose the student to systematic botany
- To learn the basics of morphology and taxonomy of crops

Course Outcome:
- The students learned the basics of botany
- The students familiarized with botanical terms in relation to horticultural crops
- This fundamental course helped students to understand the breeding of horticultural crops

Description:
Systematic botany – terminology, morphological description and classification – root, stem, leaf, inflorescence, flower and fruit – flowering mechanism – modes of pollination asexual/vegetative reproduction – floral biology – fertilization and fruit set. Principles involved in nomenclature, ICBN rules and recommendations with special reference to names of hybrids and names of cultivated plants. Floral biology, pollination, fruit set and economic part in the families; Anacardiaceae (mango, cashew), Rutaceae (acid lime, sweet orange and mandarin), Musaceae, Moraceae, Vitaceae, Caricaceae, Euphorbiaceae (aonla, cassava, rubber), Myrtaceae (guava, clove), Sapotaceae, Bromeliaceae, Punicaceae, Annonaceae (cudast apple), Rhamnaceae and Rosaceae (apple, pear, plum, rose). Floral biology, pollination, fruit set and economic part in the families; Solanaceae (tomato, brinjal, chilli, potato), Malvaceae, Cucurbitaceae (chukka, watermelon, muskmelon, ridge gourd, bitter gourd, cucumber), Moringaceae, Fabaceae (peas, French beans), Alliaceae (onion, garlic), Brassicaceae (cabbage, cauliflower, radish), Chenopodiaceae, Amaranthaceae, Convulvulaceae (sweetpotato), Araceae (elephant foot yam, colocasia), Dioscoreaceae (yam, medicinal Dioscorea). Floral biology, pollination, fruit set and economic part in the families; Piperaeaceae (pepper, betelvine) Zingiberaceae (cardamom, turmeric, ginger), Orchidaceae (Vanilla, Dendrobium orchid), Apiaceae (Umbelliferae) (coriander), Myristicaceae, Lauraceae, Leguminosae, Caesalpiniaceae, Camellaceae, Rubiaceae, Arecaecae(Palmae) (coconut, arecanut, palmyrah, oil palm), Sterculiaceae(Cocoa). Floral biology, pollination, fruit set and economic part in the families; Oleaceae (mulligai, mullai, jathimalli), Asteraceae (chrysanthemum, marigold, marigold, gerbera, golden rod, aster, pyrethrum), Amaryllidaceae, Acanthaceae, Caryophyllaceae, Iridaceae, Apocynaceae, Poaceae (Graminae), (lemongrass, citronella, palmarosa, vetiver), Geraniaceae, Labiaceae (Labiatae) (coleus, patchouli, mint, maruvu), Scrophulariaceae.

Practical:
Observations and recordings of the morphology of root, stem, leaf, flower and fruit. Study of taxonomy and morphology of crops in the above families – herbarium (minimum 50 – covering not less than 25 families) - collection of the crops mentioned in theory.

References:
Course Objectives:
- To impart skill oriented knowledge on media preparation
- To teach students on propagation methods
- To familiarize with the maintenance and after care of propagated plants

Course Outcome:
- Students benefited with hands-on training in media preparation
- Students learned about mother plant selection and propagation techniques
- Students familiarized with the maintenance and after care of propagated plants

Description:

Practical:

References:

17HO1003 PRODUCTION TECHNOLOGY OF TROPICAL AND ARID ZONE FRUIT CROPS

Credits: 2:0:1

Course Objectives:
- To impart knowledge on the scenario of fruit cultivation in tropical and arid zones
- To impart knowledge on advanced production techniques
- To apprise on production constraints

Course Outcome:
- Practical knowledge on specialized production techniques of tropical and arid zone fruits
- Understanding the production constraints
- Skill management for solving field problems

Description:

Practical:
Description and identification of cultivars/varieties - nursery management - nursery preparation, seed sowing and raising seedlings / rootstocks, practicing propagation techniques of mango, banana, papaya, sapota, guava, acid lime, sweet orange, aonla, ber, pomegranate, date palm, custard apple, jamun, bael, wood apple and manila tamarin. Banana scoring techniques. Selection and pre-treatment of banana suckers - desuckering in banana –planting systems- manures, fertilizers and biofertilizers application in mango, banana, papaya, sapota, guava, acid lime, sweet orange and aonla – application of growth regulators - sex forms in papaya – sibmating and seed production in papaya – latex extraction and preparation of crude papain – training and pruning in mango, sapota, guava, acid lime and sweet orange, aonla, ber, pomegranate and date palm - practising harvesting methods - ripening of fruits - grading and packaging - visit to commercial orchards - project preparation on production economics for fruits.

References:

17HO1004 PRODUCTION TECHNOLOGY OF TROPICAL VEGETABLE CROPS

Credits: 2:0:1

Course Objectives:
- To teach the students on the scenario of vegetable cultivation
- To impart knowledge on advanced production techniques
- To apprise on production constraints

Course Outcome:
- Hands-on experience of vegetable cultivation
- Knowledge on quality requirement and production techniques
- Skill management for solving field problems

Description:
Overview of vegetable cultivation: Area, production, world scenario, industrial importance, export potential of tropical vegetable crops – institutions involved in vegetable crops research. Classification of vegetable crops - Effect of climate, soil, water and nutrients on vegetable crop production and their management– cropping systems. Vegetable production in nutrition garden, kitchen garden, truck garden, market garden, roof garden, floating garden – types of vegetable farming and contract farming- rice fallow cultivation, river bed cultivation, rain fed cultivation, organic farming – GAP in vegetable production – export standards of vegetables. Solanaceous vegetables and bhendi: Composition and uses – area and production- climate and soil requirements – season-varieties and hybrids – seed rate- nursery practices-containerized transplant production and transplanting – preparation of field-spacing-

**Practical:** Identification and description of tropical vegetable crops—nursery practices and transplanting for transplanted vegetable crops—preparation of field and sowing/planting for direct sown/transplanted vegetable crops, kitchen garden—herbicide use in vegetable culture—top dressing of fertilizers and inter-culture—use of growth regulators—identification of nutrient deficiencies—physiological disorders—harvest indices and maturity standards—post harvest handling and storage—marketing—seed extraction—working out cost of cultivation for tropical vegetable crops—project preparation for commercial cultivation. Visit to commercial vegetable growing areas, market and processing centre.

**References:**