TAMIL NADU AGRICULTURAL UNIVERSITY

DIPLOMA IN AGRICULTURE PROGRAMME
SYLLABUS - 2022
Semester wise - Course No, Title and Credit hours

I SEMESTER

Course No.	Course Title	Credit Hours
AGR D11	Principles of Agronomy and Agricultural Meteorology	1+2
AGR D12	Irrigation and Weed Management	1+1
SAC D11	Basics of Soil Science	1+1
HOR D11	Propagation Methods in Horticultural Crops	0+1
AGM D11	Basic and Applied microbiology	1+1
ENG D11	Farm Machinery and Post harvest Processing	2+1
COM D11	Introduction to Computer and its Applications	0+1
LAN D11	English Language for Effective Communication	0+1
PED D11	Physical Education	0+1
	Total	**6+10=16**

*PED D11 course shall be registered during I semester and continued in II semester.

II SEMESTER

Course No.	Course Title	Credit Hours
AGR D13	Agronomy of Field Crops- I	1+1
STH D11	Seed Production Techniques in Field Crops	1+1
HOR D12	Vegetable and Fruit culture	2+1
AEN D11	General and Economic Entomology	2+1
PAT D11	Principles of Plant Pathology	1+1
SAC D12	Soil Nutrient Management	1+1
ENS D11	Energy and Environment	1+1
	Total	**9+7=16**

* the evaluation for PED D11 course shall be done at II semester.

III SEMESTER

Course No.	Course Title	Credit Hours
AGR D21	Agronomy of Field Crops-II	1+1
AGR D22	Crop Production-I	0+2
AGB D21	Methods of Plant Breeding	1+1
AEN D21	Crop Pests and Their Management	1+2
PAT D21	Crop Diseases and Their Management	1+2
CAG D21	Commercial Agriculture-I	0+2
AEC D21	Agricultural Economics, Finance and Marketing	1+1
	Total	**5+11=16**

IV SEMESTER

Course No.	Course Title	Credit Hours
AGR D23	Dry Farming and Agro forestry	1+1
AGR D24	Crop Production - II	0+2
AGB D22	Breeding of Field Crops	1+1
HOR D21	Floriculture, Medicinal, Aromatic, Spices and Plantation crops	2+1
AMP D21	Fundamentals of Livestock and Poultry Management	2+1
CAG D22	Commercial Agriculture - II	0+2
AEX D21	Extension Education and Transfer of Technology	1+1
AEX D22	Study Tour	0+1
	Total	**7+10=17**

TOTAL CREDIT HOURS

S. No.	Semester	Credit hours
1	**I**	**6+10=16**
2	**II**	**9+7=16**
3	**III**	**5+11=16**
4	**IV**	**7+10=17**
	Total	**27+38=65**

TAMIL NADU AGRICULTURAL UNIVERSITY

DIPLOMA IN AGRICULTURE

I Semester

S. No.	Course No.	Course Title	Credit Hrs.
1.	AGR D11	Principles of Agronomy and Agricultural Meteorology	1+2
2.	AGR D12	Irrigation and Weed Management	1+1
3.	SAC D11	Basics of Soil Science	1+1
4.	HOR D11	Propagation Methods in Horticultural Crops	0+1
5.	AGM D11	Basic and Applied microbiology	1+1
6.	ENG D11	Farm Machinery and Post harvest Processing	2+1
7.	COM D11	Introduction to Computer and its Applications	0+1
8.	LAN D11	English Language for Effective Communication	0+1
9.	PED D11	Physical Education	0+1
		Total	**6+10=16**

Note: PED D11 course registered during I semester and the evaluation done at II semester.

AGR D11	Principles of Agronomy and Agricultural Meteorology	(1+2)

Objectives

- ❖ Basic principles and concepts of agronomy are explained to the students in detail since it is a basic subject which assumes significance in agriculture.
- ❖ To form basis for further learning of other agronomy courses in subsequent semesters.
- ❖ To expose students to the importance and scope of meteorology in agriculture.

Theory syllabus

Agriculture - Definition - Scope of agriculture in India and Tamil Nadu - Branches of Agriculture - Agronomy - Agronomic Classification of Crops - Major crops of India and Tamil Nadu -Factors affecting Crop Production - Moisture, Aeration, Light, Temperature and Soil Nutrients - Principles and practices of agricultural operations - Tillage - Intercultural Operations, Implements and tools in Agriculture - Cropping Systems - Principles - Merits and demerits -Seeds and Sowing - Seed treatment - Optimum plant population - Crop geometry - Nursery – Transplanting - After cultivation - weed management - irrigation management – Manures and fertilizers - Methods of application - Harvesting - Post harvest techniques - Meteorology - Agricultural Meteorology - Atmosphere - Weather parameters and their role in crop production - Rainfall - Agro Climatic Zones of Tamil Nadu

Lecture schedule

Lecture No.	Contents to be dealt
1.	Agriculture - Definition - Scope of agriculture in India and Tamil Nadu - Branches of Agriculture - Agronomy - Scope of Agronomy - Art and Science of Crop Production
2.	Agronomic Classification of Crops - Major crops of India and Tamil Nadu - Rice, wheat, maize, sorghum, cumbu, chick pea, redgram, green gram, black gram, groundnut, sunflower, gingelly, cotton, sugarcane
3.	Factors affecting Crop Production – Climate and weather factors – climate classification and its suitability for different field crops
4.	Factors affecting Crop Production – Soil factors – major soils and suitability for different field crops – crop and soil
5.	Principles and practices of agricultural operations - Tillage – Definition, types, objectives - Tilth – types
6.	On season tillage - Preparatory tillage - Primary and Secondary tillage - Inter tillage / inter cultivation - Off season tillage- Special types of tillage – modern concepts of tillage - Implements and tools in Agriculture

7.	Seeds - Sowing – methods - Seed treatment – objectives and methods - Nursery - Transplanting
8.	Irrigation –definition –Crop water requirement – irrigation scheduling
9.	**Mid semester examination**
10.	Optimum plant population - Crop geometry - types and factors affecting them - Gap filling and thinning
11	Manures - Organic Manures, Green Manures, Fertilizers - Methods of application - Basal, Split and Foliar Application
12.	After cultivation- Weeding and Hoeing, Earthing up, other inter cultural operations. Weeds – definition - weed management –irrigation – definition – methods
13.	Harvesting – time and methods of harvesting, Threshing, Drying, Storage and Post harvest techniques
14.	Meteorology - Agricultural Meteorology – Definition, importance and scope of agricultural meteorology for crop production
15.	Atmosphere - Components and its importance - Weather parameters – Precipitation, temperature, atmospheric humidity, solar radiation, wind velocity, atmospheric gases - Role in crop production
16.	Rainfall – Monsoon - Spatial and Temporal variability in Tamil Nadu across seasons.
17.	Agro Climatic Zones of Tamil Nadu - North eastern zone, North western zone, Western zone, Cauvery delta zone, Southern zone, High rainfall zone ,Hilly zone

Practical syllabus

Identification of crops – Agro eco system - Acquiring skill and Practicing tillage implements and special purpose implements - Practicing nursery bed preparation for low lands and irrigated uplands - Practicing special operations in wet lands - Land shaping - Learning and acquiring skills in seed treatment - Practicing sowing and transplanting - Practicing manual weeding -Irrigation layout for upland irrigated crops - Practicing application of organic manures and green manures - Inorganic fertilizers identification - Practicing various method of fertilizers - Fertilizer requirement calculation - Practicing earthing up - Measurement of growth and yield components - Visiting agromet observatory - Handling rain gauge, maximum, minimum, dry and wet bulb thermometers - Study of wind vane and anemometers – Evaporimeter - Collection of historic rainfall and temperature data - Computing mean of rainfall data and temperature data -Forecasts- Agro advisories

Practical schedule

Ex.No.	Contents to be dealt
1.	Low land - characteristics, identification of crops - Irrigated uplands - characteristics, identification of crops

2.	Drylands - characteristics, identification of crops
3.	Identification and acquiring skill in the primary tillage implements - country plough, mould board plough, disc plough, Melur plough
4.	Identification and acquiring skill in the secondary tillage implements - cultivators and harrows
5.	Identification and practicing special purpose implements - leveler, weeder, sub soiler
6.	Identification of seeds, green manures, organic manures
7.	Practicing implements used in rice cultivation - puddler, transplanter, weeders, harvester
8.	Skill learning and practicing nursery bed preparation for low lands
9.	Skill learning and practicing nursery bed preparation for irrigated uplands
10.	Practicing trimming and plastering in wet lands
11	Land shaping and lay out of field for upland irrigated conditions
12.	Acquiring skills in seed treatment of plant protection chemicals
13.	Learning seed, seedling treatment and soil application of bio-fertilizers
14.	Practicing sowing - broadcasting, dibbling, sowing behind the plough, drill sowing or drilling – Transplanting
15.	Practicing manual weeding
16.	Irrigation layout for upland irrigated crops - surface, subsurface and pressurized irrigation
17.	**Mid semester examination**
18.	Practicing application of organic manures
19.	Practicing application of green manures and green leaf manures
20.	Identification of inorganic fertilizers
21.	Practicing various method soil application of fertilizers - broadcasting, band placement, point placement, sub soil placement, fertigation
22	Practicing fertilizer requirement calculation and foliar application of fertilizers
23.	Practicing earthing up in major crops and understanding its importance
24.	Measurement of growth components of rice, maize, black gram, green gram, cotton
25.	Measurement of yield components of rice, maize, black gram, green gram, cotton
26	Visit to agromet observatory
27.	Handling rain gauge and recording rainfall
28.	Handling of maximum, minimum, dry and wet bulb thermometers and recording of temperatures
29.	Study of wind vane, anemometers, open pan evaporimeter
30.	Collection of historic rainfall and temperature data and tabulation
31.	Computing mean of rainfall data; standard week wise, month wise and season wise

32.	Computing mean of temperature data; standard week wise, month wise and season wise
33.	Gathering information on forecasts and understanding agro advisories
34.	**Final Practical examination**

Course outcome

The course syllabus emphasizes practical experience on various principles and practices involved in agronomy and agricultural meteorology. Hence the students will certainly be benefited and gain confidence to become a successful entrepreneur in agriculture.

References / Text books

Yellamananda Reddy, T. and G.H. Sankara Reddi. 2014. Principles of Agronomy. Kalyani Publishers, New Delhi.

Mavi, H.S. 1996. Introduction to Agrometeorology, oxford and IBH Publishing Co., New Delhi.

AGR D12	Irrigation and Weed Management	(1+1)

Objectives

- To acquire knowledge on importance of water management in agriculture and develop skills on various aspects of water saving technologies to produce more yield per unit of water.
- To understand the significance of weed management in crop production and develop skills on various weed management practices to major field crops to get higher productivity.

Theory Syllabus

Role of water in plant growth – Water resources and irrigation potential of Tamil Nadu - Importance of irrigation - Soil moisture constants - Permanent Wilting Point, Field capacity, Available Soil moisture and Saturation - Crop water requirement- Factors affecting water requirement – Critical stages for irrigation and water requirement of crops – Water use Efficiency - Methods of irrigation: surface, sub-surface sprinkler and drip irrigation – Micro irrigation: layout, suitability, merits and scope – Water management for different field crops - Quality of irrigation water – Agronomic practices for use of poor quality water (saline, effluent and sewage water) for irrigation.

Weeds – Definition, classification and characteristics, harmful and beneficial effect of weeds - Classification and characteristics of weeds of different agro ecosystems-lowland weeds, irrigated upland and rainfed land weeds - Classification and characteristics of weeds – Aquatic, parasitic and obnoxious weeds - Crop weed interactions - Critical crop weed competition, competitive and allelopathic effects of weeds and crops. - Principles and methods of weed management: Preventive, cultural, mechanical, chemical, biological and alternate methods - Classification and characteristics of herbicides and herbicide formulations - Integrated weed management practices for major filed crops - Weed management practices for parasitic and problematic weeds

Lecture Schedule

Lecture No.	Contents to be dealt
1.	Role of water in plants – importance of irrigation - water resources of Tamil Nadu.
2.	Soil moisture constants - permanent wilting point, field capacity, available soil moisture and Saturation - Plant water stress – causes – plant response and adaptations – methods to overcome plant water stress.
3.	Crop water requirement - components of crop water requirement, factors affecting crop water requirement - critical stages for irrigation – water

	requirement for different field crops - Water use efficiency.
4.	Methods of irrigation - merits, demerits, suitability of surface (flooding, beds and channels, border strip, ridges and furrows, check basin, ring basin, broad bed and furrows, surge irrigation) and sub-surface irrigation methods.
5.	Micro irrigation system (drip and sprinkler irrigation) - suitability, components, layout, operation, advantage and disadvantage, government support to popularize micro irrigation systems
6.	Water management for cereals (rice, wheat, maize, sorghum, ragi, minor millets) and pulses (blackgram & greengram, redgram, soybean).
7.	Water management for oilseeds crops (groundnut, sesamum and sunflower) and commercial crops (cotton and sugarcane)
8.	Quality of irrigation water –classification of quality of irrigation water based on different salts - agronomic practices for use of poor quality water (saline, effluent and sewage water).
9.	**Mid semester examination**
10.	Weeds – Definition, classification and characteristics, harmful and beneficial effect of weeds
11.	Classification and characteristics of weeds - Different agro ecosystems, Aquatic, parasitic and obnoxious weeds
12.	Crop weed interactions - Critical crop weed competition, competitive and allelopathic effects of weeds and crops.
13.	Principles and methods of weed management:Preventive, cultural, mechanical, chemical, biological and alternate methods
14.	Herbicides – merits and demerits of using herbicides – classification based on mode of action and method of application - herbicide formulations
15.	Herbicide interaction with agrochemicals –Fertilizers –Insecticides – Fungicides
16.	Integrated weed management practices for major field crops (rice, wheat, maize, sorghum, ragi, minor millets), pulses (blackgram & greengram, redgram, soybean), oilseeds (groundnut, gingelly, sunflower)and commercial crops (cotton and sugarcane)
17.	Weed management practices for parasitic weeds (Striga, Orobanche and Loranthus) and problematic weeds (Cynodon, Cyperus, Parthenium, Kattukandan kathiri), Aquatic weeds (water hyacinth).

Practical syllabus

Measurement of irrigation water through water measuring devices (flumes and weirs) – Calculation of irrigation water requirement (problems) – Acquiring skill in land shaping for different surface irrigation methods – Operation and economics of sprinkler and drip irrigation systems – Scheduling of irrigation based on different approaches – On-farm irrigation structures – Visit to irrigation command area (Reservoirs and tanks) and water management institutes.

Identification, classification and characterization of weeds of different eco-system - Practicing Skill development on cultural and non chemical weed management - Identification of herbicides and their usage and method of application - Practicing Skill development on herbicide application techniques - Practicing skill development on spray equipment's and spray fluid calibration - Calculation of different weed indices - Calculation of herbicide quantity and recommendation for different eco systems - Practicing skill development on mechanical methods of weed control using different types of weeders .

Practical schedule

Ex No.	Contents to be dealt
1.	Measurement of irrigation water with flumes and weirs
2.	Land levelling and land shaping - Beds and channels - ridges and furrows, border strips - broad bed furrow method of irrigation- ring basin
3.	Scheduling of irrigation based on indicator plants, soil-sand mini plot technique, available soil moisture and IW/CPE ratio
4.	Definition for TMC,Cusec, Cumec, calculation of irrigation water based on water flow (discharge from open channel and motor pump) , depth of irrigation, IW/CPE ratio and area basis.
5.	Layout, operation and maintenance of drip and sprinkler irrigation systems.
6.	Observation of irrigation structures in wetlands and irrigated drylands.
7.	Visit to irrigation command area – Visit to irrigation management and training institute
8.	Identification, classification and characterization of weeds of different eco-system
9.	**Mid-semester Examination**
10.	Practicing skill development on cultural and non-chemical weed management
11.	Identification of herbicides and their usage and method of application (crop,chemical name & dose, trade name & dose and time of application.)
12.	Practicing skill development on spray equipment's and spray fluid calibration
13.	Practicing skill development on herbicide application techniques
14.	Calculation of different weed indices.
15.	Calculation of herbicide quantity and recommendation for different eco systems
16.	Practicing skill development on mechanical methods of weed control using different types of weeders (cono weeder, star weeder, power weeder and brush cutter).
17.	**Final practical examination**

Course Outcome

By undergoing the course of irrigation & weed management, the students can acquire both theoretical knowledge and practical experience for increasing water use efficiency in agriculture and effective weed management practices to get higher crop productivity.

References

1. Michael, A.M. 1997. Irrigation: Theory and Practice Vikas Publishers
2. Prihar, S.S. and B.S. Sandhu. 1987. Irrigation to field crops: Principles and Practices. ICAR Publication.
3. Sankara Reddy, G.H. and T. Yellamanda Reddy. 1997. Efficient use of irrigation water. Kalyani Publishers
4. Jaganathan R., and R.Jayakumar. 2003. Weed Science Principles, Kalyani Publishers, New Delhi.
5. Rao, V. S. 1983. Principles of Weed Science. Oxford and IBH Publishing Co. New Delhi.
6. Subramanian, S. A. Mohammed Ali and R. Jayakumar. 1991. All about Weed Control. Kalyani Publishers, New Delhi.

SAC D11	Basics of Soil Science	(1+1)

Objectives

To impart basic knowledge about soil, its physical and chemical properties. To educate students about fundamental concepts and management of problem soils and poor quality water.

Theory Syllabus

Soil - composition and definition - Description of soil profile, Master horizons. Soil physical properties - Colour, Texture, Structure, Bulk density, Pore space, Soil water, Soil air, Soil temperature. Soil colloids - Ion exchange phenomena. Soil chemical properties - Soil pH and EC. Carbon and Nitrogen cycle - Soil Organic Matter and its importance on soil properties. Soils of Tamil Nadu. Problem soils - Physical constraints and their management - chemical constraints - Acid, saline and sodic soils - Genesis, effect on soil and plant - Management aspects - Irrigation water quality - Management of poor quality water.

Lecture Schedule

Lecture No.	Contents to be dealt
1.	Soil - composition - mineral matter, organic matter, soil water, soil air - Soil definition - soil as a three dimensional body - Description of soil profile, Master horizons - elemental composition of earth crust - Comparison of soil with animal system - Definitions of pedology and edaphology - List of important soil properties – physical, chemical and biological.
2.	Soil colour - Role of minerals, organic matter, moisture - Munsell colour chart - Hue, Value, Chroma - Importance of soil colour. Soil Texture - définition - ISSS classification of soil particles - Textural triangle -Importance of soil texture.
3.	Soil structure - définition - Mechanism of aggregate formation - Cementing agents - Classification - Types, Classes, Grades - Factors affecting soil structure - Significance of soil structure
4.	Bulk density, Particle density and Pore space - Definition - Factors influencing bulk density - Optimum bulk density for crops.
5.	Soil water -Definitions of Infiltration, Percolation - Soil moisture constants - Field capacity, wilting point, hygroscopic coefficient, available soil water - Factors affecting soil water - Soil moisture measurement - Gravimetric, gypsum block, tensiometer.
6.	Soil air - Composition - Factors affecting composition of soil air -

	Significance in crop production. Soil temperature - Sources of soil heat - Effect of soil temperature on plant growth - Soil temperature management - Methods of measurement - Soil thermometer, IR thermometer.
7.	Soil colloids - organic and inorganic colloids - source of charges - Ion exchange - CEC and AEC and its significance.
8.	Soil reaction - definition of Soil pH - Measurement of soil pH, Ranges in soil pH, Acidic, neutral, alkaline, calcareous - Effect of pH on nutrient availability - Soil pH and microbial activity. Soil electrical conductivity - Measurement of soil EC - Rating of soil EC - Effect on crop growth.
9.	**Mid-Semester Exam**
10.	Carbon Cycle - Importance of carbon sequestration. Nitrogen Cycle - Nitrogen transformation - N fixation, ammonification, nitrification, denitrification, aminization, ammonia volatilization.
11.	Soil Organic Matter (SOM) - Sources - Factors affecting - Importance on soil properties
12.	Soils of Tamil Nadu - Area, properties, constraints, uses - Alluvial soil, Black Soil, Red Soil, Laterite soil.
13.	Problem soils - Physical constraints - Slow permeable soils, Excessively Permeable, Sub soil hardening /hard pan, Surface crusting, Fluffy paddy soils, Shallow soils - constraints and management.
14.	Problem soils - Chemical constraints - Acid soils - Genesis, effect on soil and plant - Management aspects.
15.	Problem soils – Saline and Sodic soils - Genesis, effect on soil and plant - Management aspects.
16.	Irrigation water quality - Ratings followed in Tamil Nadu based on Electrical Conductivity (EC), Sodium Absorption Ratio (SAR), Residual Sodium Carbonate (RSC) - Management of poor quality water.
17.	Remote Sensing –Concepts and Foundations – GIS. GPS and Drones for Precision Agriculture

Practical Syllabus

Soil profile - Master horizon identification - Soil sample collection - Determination of soil texture by feel method - Bulk density, particle density and pore space - Determination of soil moisture - soil colour - Analysis of soil pH and EC - Determination of gypsum requirement for sodic soils - Irrigation water quality analysis and interpretation of data.

Practical Schedule

Ex No.	Contents to be dealt
1.	Soil profile - Master horizon identification
2.	Soil sample collection and preparation
3.	Determination of soil texture by feel method
4.	Determination of bulk density, particle density and pore space by cylinder method
5.	Determination of bulk density by wax coating method, core sample method
6.	Determination of soil colour
7.	Determination of soil moisture by oven dry method
8.	Analysis of soil for pH and EC
9.	**Mid-Semester Exam**
10.	Computation of available soil moisture in soil layers
11.	Determination of gypsum requirement for sodic soil
12.	Irrigation water quality analysis - pH, EC, carbonate and bicarbonate
13.	Irrigation water quality analysis - Ca, Mg
14.	Irrigation water quality analysis - Na, K
15.	Interpretation of irrigation water quality using analytical data - SAR, RSC
16.	Observation of problem soils in local areas
17.	**Final practical examination**

Course Outcome

Basic knowledge about Soil Science, its important physical and chemical properties. Importance of soil constituents on soil properties. Knowledge about problem soils and weed management.

References

Dilip Kumar Das. 2004. Introductory Soil Science, Kalyani Publishers, New Delhi.

Sahai, V.N. 2008. Fundamentals of Soils. Kalyani Publishers, New Delhi.

HOR D11	Propagation methods in Horticultural Crops	(0+1)

Objective

To understand and practice the propagation methods of horticultural crops

Practical syllabus

Selection of nursery site and layout of nursery components - Media for propagation of nursery plants and pot mixture preparation - Containers, tools and implements for nursery - Plant propagation structures - Practicing raised bed nursery - Protray nursery techniques- Preparation of cutting, layering , grafting and budding in horticultural crops - Specialized plant propagation parts in horticultural crops - Tissue culture methods of propagation in horticultural crops - Hardening and marketing of tissue culture plants - Project preparation for nursery establishment - Visit to commercial nursery production centers

Practical schedule

Ex. No	Contents to be dealt
1.	**Selection of nursery site and layout of nursery components** Nursery-Definition- Importance of Nursery- Advantages of raising seedlings in nursery- Selection of site-Components of nursery- Layout of nursery - Land preparation-Collection and planting of mother plants-Management of Nursery - Storage of propagated plants in nursery beds
2.	**Media for propagation of nursery plants and pot mixture preparation** Media – Definition- Properties of good media – Soil, Sand, Peat, Sphagmum moss, Vermiculite, Perlite, Pumice, Leaf mould, Sawdust, Coco peat, Farm yard manure - Pot mixture preparation, Quality of pot mixture, Ingredients for pot mixture preparation, Pot mixture composition for different horticultural crops.
3.	**Containers , tools and implements for nursery** Containers – (Seed pan and seed boxes, Earthen pots, Polythene bags, Plastic pots) -Tools – (Rose can / Water can, Crow bar, Garden shears, Scythe, Digging fork, Shovel, Secateur, Budding and Grafting knife, Hand hoe, Spade Fruit Harvester, Garden rake, Pruning saw, Tree pruner, Garden fork, Iron pan, Rocker sprayer, Backpack sprayer) - Implements – (Rotavator, Cultivator, Disc plough, Bund former, Tractor drawn auger)
4.	**Plant propagation structures** Definition- Advantages & disadvantages - Greenhouse Covering Materials - Mist Chambers - Plastic tunnels- Poly-houses , Shade net houses
5.	**Practicing raised bed nursery** Advantages of raised bed nursery - Procedure for preparation of raised bed and seed sowing.
6.	**Protray nursery techniques** Protray- Advantages & disadvantages – Media – Seed rate – seedling raising –

	Cost of seedling production
7.	**Preparation of cutting in horticultural crops** Definition - Root cuttings - Stem cuttings (Hard wood cuttings, Semi hard wood, soft wood cuttings, herbaceous cuttings) – Leaf cuttings (Whole leaf with Petiole, Whole Leaf without Petiole, Leaf Sections)-Use of rooting hormones
8.	**Preparation of layering in horticultural crops** Definition- Advantages & disadvantages – Ground layering (Simple layering, Compound or serpentine layering, Tip layering, Trench Layering, Mound Layering) & air layering
9.	**Mid semester practical examination**
10.	**Preparation of grafting in horticultural crops** Definition – grafting, root stock, scion, advantages & disadvantages Inarching or approach grafting, Epicotyl or stone grafting, Softwood grafting, Side grafting, Whip or splice grafting, Whip and tongue grafting, Cleft grafting, Veneer grafting, Bark grafting, Bridge grafting
11.	**Preparation of budding in horticultural crops** Definition- advantages & disadvantages- Characters of rootstock for budding - Bud wood- Characters of bud wood- Shield or 'T' budding or '⊥' budding- Patch budding- Chip budding- Flap or forket budding- Ring budding- Flute budding
12.	**Specialized plant propagation parts in horticultural crops** Bulb, Corm, Tuber, Tuberous roots and stem, Rhizome, Runner, Offset Sucker, Division, Stolon, Bulbils, Crown
13.	**Tissue culture methods of propagation in horticultural crops** Definition – Totipotency- advantages & disadvantages- Steps in micro propagation
14.	**Hardening and marketing of Tissue culture plants** Definition- Acclimatization - steps in hardening of tissue culture plants –Market profile- Industries supplying tissue culture plants
15.	**Project preparation for nursery establishment** Components of nursery – Mother block for scion – root stock – plant propagation structures (Mist chamber, shade net house) cost – fixed cost – recurring cost – cost analysis
16.	**Visit to commercial nursery**
17.	**Final practical examination**

Course outcome

The students will be familiarized with propagation techniques of major horticultural crops

References/ Text books

N Kumar 2010, Introduction to Horticulture, Oxford and IBH Publishing Co Pvt. Ltd., New Delhi, India

AGM D11	Basic and Applied Microbiology	(1+1)

Objective

This course is designed to give students an understanding on the role of microorganisms in agriculture and industrial processes. The course encompasses the use of microorganisms in the manufacture of biological products like bio fertilizers, biocontrol agents using microorganisms, microbial value addition, wine making and preparation of fermented foods.

Theory syllabus

Microorganisms (bacteria, fungi, actinomycetes, yeast and algae). Importance of microorganisms. Beneficial microbes in agriculture and industry. Industrially important microorganisms and its application. Soil organic matter. Soil organic carbon- Humus- Decomposers- Heterotroph, Mesophiles, Thermophiles. Composting – different types, vermicomposting.Bio fertilizers – types, mass production methods and techniques. Production of liquid and carrier based bacterial bio fertilizers. Algal and Azolla biofertilizers production. Fungal biofertilizer - Production of VAM – dosage, method of application and storage. Biocontrol agents –Different types. Mass production of *Pseudomonas* and *Trichoderma.* Shelf life, dosage and methods of application. Bioinoculants. Traditional fermented food products. Fermented dairy products - cheese, probiotics, yogurt. Bread making, Wine making, Single cell protein- Spirulina production.

Theory Schedule

Lecture No.	Contents to be taught
1.	Microorganisms an overview. (Definition- microorganisms,microbiology. Characters of bacteria, fungi, actinomycetes, and algae, difference between prokaryotes and eukaryotes)
2.	Importance of microorganisms, Beneficial microbes in agriculture and industry – Industrially important microorganisms. (uses of microorganisms in various industries- butter industry , cheese industry, vinegar industry, milk industry- pasteurization, alcohol industry, tobacco curing, tea curing, leather tanning, fibre retting, sewage treatment, ensilages, medicine, Agriculture- soil microorganisms, bio fertilizers)
3.	Soil organic matter and humus formation. (Organic matter decomposition, components of humus and its uses)(Carbon and Nitrogen Cycles)
4.	Microorganisms involved in organic matter decomposition and their types
5.	Composting - methods of composting and vermicompost (Composting-

	definition, farm compost, town compost, windrow method of composting, Coimbatore method, Bangalore method and indore method of composting, vermicomposting)
6.	Biofertilizers- types of biofertilizers (Definition of biofertilizer, nitrogen fixing microorganisms, phosphorus solubilising microorganisms, phosphorus mobilizing microorganisms, potash solubilizing microorganisms, PGPR,)
7.	Mass production methods of bacterial biofertilizers- liquid and carrier based formulations. (production of *Azospirillum*, Phosphobacteria, Potash Solubilising bacteria, *Azotobacter*, *Rhizobium*)
8.	Cyanobacteria (BGA) and Azolla- mass production and application (BGA- field preparation, mass multiplication, harvesting and packing, method of application, Azolla- multiplication in tray or pit, duel culture method, uses)
9.	**Mid semester examination**
10.	VAM fungi production- dosage and method of application (mycorrhizae- definition, types of mycorrhizae, AM Fungi production – pit method, method of application)
11.	Biocontrol agent - types of biocontrol agents (bacterial, fungal and viral biocontrol agents, Biological disease control agents, biological pest control agents)
12.	Mass production of biocontrol agents (Bacillus Subtilis and *Trichoderma Viride)*
13.	Shelf life and storage of biofertilizers and biocontrol agents (durability and storage conditions, viable cell count as per standards for liquid and solid biofertilizers)
14.	Traditional fermented food products (Idly, curd, athirasam, kool, bread, cheese, yogurt, sauerkraut, pickle etc)
15.	Fermented dairy products - cheese, probiotics, yogurt (raw materials, microorganisms involved in the production, types of cheese)
16.	Commercial production of bread and wine (raw materials, production process, microorganisms involved in the production)
17.	Single cell protein - Mass production of Spirulina (Spirulina- characters, uses, commercial production methods)

Practical syllabus

Description of glassware and instruments used in microbiology, Composting and vermicomposting, Types of media and carrier materials, culture media preparation for bacterial biofertilizers, Pilot scale production of bacterial biofertilizers, mass production of biofertilizers, production of Algal and Azolla and VAM biofertlizers, Production of biocontrol agents, production of bread, cheese, yogurt and wine. Single cell protein production.

Practical schedule

Ex.No	Contents to be taught
1.	Description of glassware and instruments (Autoclave, laminar air flow chamber, hot air oven, fermentor, glassware) used in microbiology
2.	Composting of agricultural waste and effective microorganisms (EM)
3.	Vermicomposting
4.	Types of media and carrier materials for biofertilizer production (liquid and solid medium preparation,)
5.	Preparation of culture media for bacterial biofertilizers eg. *Azospirillum* and Phosphobacteria(Potassium solubilizer and PPFM)
6.	Pilot scale production of bacterial biofertilizers.
7.	Liquid biofertilizer production
8.	Visit to biofertilizer production laboratory
9.	**Mid semester examination**
10.	Mass production of Algal and Azolla biofertlizers
11.	AM Fungi mass production
12.	Production of biocontrol agents- *Pseudomonas*
13.	Production of cheese and yougurt
14.	Bread making – Visit to bakery unit
15.	Production of wine
16.	Spirulina production
17.	**Final Practical Examination**

Course Outcome

Students will have basic understanding on the role of microorganisms in agriculture and industrial processes. They will acquire knowledge on biofertilizers, biocontrol agents, composting, vermicomposting and microbial food products. This course will provide complete idea about integrated nutrient management and organic farming practices.

References

1. Michael J. Pelczar,JR., E.C.S. Chan, Noel R. Krieg, 2005. Microbiology

2. Casida, JR. L.E. 2006 Industrial Microbiology, New Age International Publishers, New Delhi.

3. Subba Rao, N.S., 1999. Soil Microorganisms and Plant growth, Oxford & IBA, New Delhi.

ENG D11	Farm Machinery and Post-Harvest Processing	(2+1)

Objective

To enable the students for acquiring the knowledge pertaining to farm power engine, tillage, tillage equipment, matching implements, land forming equipment, sowing methods, implements for intercultural operations, harvesting tools, unit operations, threshing, drier, rice processing, pulse milling, oil extraction.

Theory syllabus

Farm Power - Sources and their use in agriculture - Status in India - Engine – types - I.C. Engines – classification - Components - Principle and working of Two stroke and Four stroke engines – Diesel engine-Petrol engine – Comparison -Tillage – objectives- types - ploughing methods -Types of plough – Indigenous plough, Mould board plough, disc plough, chisel plough, subsoiler, Rotary plough - advantages and disadvantages - Secondary tillage equipment – cultivators, harrows - types - Tractors – types and application – matching implement - Power Tiller – Matching Implements - Land forming equipment – rotavator, puddler, bund former, Ridger, Leveller, Manuretrampler - Sowing methods - seed cum fertilizer drills - components and functions - Seed metering mechanism – Calibration of seed cum fertilizer drill - Planters – Functions – types - Pumps for irrigation – centrifugal and submersible - Implements for intercultural operations – weeding and earthing up implements -Sprayers and their functions- classification – Dusters - types and uses - Harvesting tools and equipment- sickles, reapers and combines

Post harvest losses – causes and estimates – unit operations of crop processing - Moisture content – hot air oven method - Properties of grains – mass, volume, density, porosity, surface area and sphericity - Threshing – threshers for different crops - parts, terminologies - Winnowing – manual and power operated winnowers- cleaning, grading and sorting - Types of screens - air screen cleaner-reciprocating and rotary types - Grain drying – principles - advantages - types - batch and continuous, mixing and non mixing - LSU drier – construction and operation - Storage of food grains – structures, factors affecting storage, traditional methods - types -bag and bulk storage - Silos – types- uses- advantages - Rice processing – raw and parboiling – advantages and disadvantages - Unit operations in rice processing – dehusking and polishing - Utilisation of wastes and by-products from rice mills - Pulse milling - wet, dry and CFTRI methods of pulse milling - Pulse milling equipments – construction and operation –Fruits and vegetable processing - processed products - Oil extraction methods and machineries

Theory Schedule

Lecture No.	Contents to be dealt
1.	Farm Power - Sources and their use in agriculture - Status of Farm power in India
2.	Engine – types - I.C. Engines – Components
3.	Principle and working of Two stroke and Four stroke engines – Diesel engine-Petrol engine - Comparison
4.	Tractors – types and application – matching implement
5.	Power Tiller – application -Components
6.	Tillage – objectives- types
7.	Primary tillage – objectives- ploughing methods
8.	Indigenous plough, Mould board plough, disc plough, chisel plough, subsoiler, Rotary plough
9.	Secondary tillage equipment – cultivators, harrows - types
10.	Land forming equipment – rotavator, puddler, bund former, Ridger, Leveller, laser leveller
11.	Sowing methods - seed cum fertilizer drills - components and functions
12.	Seed metering mechanism – Calibration of seed cum fertilizer drill
13.	Planters – Functions – types
14.	Implements for intercultural operations – weeding and earthing up
15.	Sprayers and their functions
16.	Harvesting tools and equipment
17.	**Mid Semester Examination**
18.	Pumps for irrigation – centrifugal and submersible
19.	Post harvest losses – causes and estimates – unit operations of crop processing
20.	Moisture content – thermo gravimetric method - wet basis and dry basis.
21.	Properties of grains – mass, volume, density, porosity, surface area and sphericity
22.	Threshing – threshers for different crops - parts, terminologies
23.	Winnowing – manual and power operated winnowers- cleaning, grading and sorting.
24.	Types of screens - air screen cleaner- reciprocating and rotary types
25.	Grain drying – principles - advantages - types - batch and continuous, mixing and non mixing
26.	LSU drier – construction and operation
27.	Storage of food grains – factors affecting storage, traditional methods - types -bag and bulk storage – Storage structures
28.	Rice processing – raw and parboiling – advantages and disadvantages
29.	Unit operations in rice processing – dehusking and polishing
30.	Utilisation of wastes and by-products from rice mills

31.	Pulse milling - wet, dry and CFTRI methods, equipments for milling
32.	Principles of fruits and vegetable processing
33.	Manufacturing of processed products from fruits and vegetables
34.	Oil extraction methods and machineries

Practical syllabus

Study of two and four stroke IC engines - MB plough and disc plough - measurement of size of cut - Study of secondary tillage implements - calibration of seed-cum-fertiliser drill - Identification of parts of tractor - power tiller - Study of Plant protection equipment - Study of weeders- harvester & tools - Moisture content determination using thermo gravimetric method - Determination of properties of food grains - Study of grain drying methods – sun drying- mechanical drying – advantages and disadvantages –Gutters and flooring - Visit to Modern Rice mill- Farm houses-sewage disposal structures-Sheds-Silos Poultry Structures -Thrashing Floor, Drying floor.

Practical schedule

Ex. No	Contents to be dealt
1.	Study of primary tillage equipments -MB plough and disc plough – chisel plough
2.	Study of secondary tillage implements – Disc harrow, cultivators
3.	Study of seed-cum-fertilizer drill & calibration –planters
4.	Identification of parts of tractor & power tiller
5.	Study of Plant protection equipments
6.	Study of weeders
7.	Study of harvester & tools
8.	Moisture content determination using thermo gravimetric method
9.	**Mid Semester Examination**
10.	Determination of properties of food grains
11.	Study of grain drying methods – sun drying- mechanical drying – advantages and disadvantages
12.	Visit to Modern Rice mill
13.	Study of Farm houses – types – sewage disposal structures – cess pool
14.	Study of Bore hole – Septic Tank Structures – Dispersion Trenches – Soak pit
15.	Study of Gutters & Floorings – loose housing system – Feeding Sheds and Milking Sheds – Silos – types – pit silo, Trench silo
16.	Study of Poultry Structures – Location and Types. Poultry Equipments –Feeders and Waterers – Brooder House Details – Thrashing Floor, drying floor
17.	**Final Practical examination**

Course outcome

The students will be familiarized with implements /equipments related to farm mechanization and Post Harvest Processing.

References/ Text books

Jagdeshwar Sahay. 2010. Elements of Agricultural Engineering. Standard Publishers andDistributors. Delhi.461 p. ISBN: 81-8014-044-X.

Senthil kumar,T., Kavitha, R., and Duraisamy, V.M. 2015. A text book of Farm Machinery.Thannambikkai Publication,Coimbatore. 233 p.ISBN: 978-93-81102-30-5.

COM D11	Introduction to Computer and its Applications	(0+1)

Objective:

To understand about use of computer and to learn basic computer applications

Practical syllabus

Introduction to computer components - Software types and user interface- Internet Utilities- Introduction to MS Office and MS Word- Introduction to MS Excel and MS PowerPoint

Ex.No	Contents to be dealt
1.	Computer - definition; Basic concepts of Hardware – Input devices, Output devices, Central Processing Unit (CPU); Software – System Software & Application Software; Applications of Computer.
2.	Computer Memory- Primary and Secondary memory;Definition of Data and Information; Assemblingcomputer components –SMPS, keyboard, mouse, monitor and printer.
3.	System Software - Operating System definition;Working with GUI based Operating System- Windows OS;Exposureto current Operating Systems.
4.	User Interface - Using Mouse; Using right button of the mouse and Moving icons on the screen;Status Bar;Control panel;Use of Common Icons – Recycle Bin andComputer.
5.	Application Software -definition; Installing/Uninstalling an Application software; Virus and antivirus definition;ExploringFiles –Creating, renaming and searching of files and folders, Usage of Help menus.
6.	Internet definition, Applications of Internet; World Wide Web and Web Browsers,Search Engines; Basic of Computer networks - LAN, WAN and MAN; Wireless network –WiFi.
7.	Connecting to internet; Internet Service Provider (ISP); Basics of internet connectivity and related troubleshooting; Understanding URL; Domain name; IP Address; Website-Agritech portal, Application of computer in agriculture.
8.	Basics of electronic mail (Email); Sending – attachment, BCC, CC and Receiving mails; Accessing sent mails, Spam, Trash; Email settings; Instant Messaging– chats.
9.	**Mid Semester Practical Examination.**
10.	Identifying different system software and application software in your computer; Introduction to Open Source Software – Office package and

	Google chrome; Introduction to MS Office package.
11.	MS Word basics - Opening, closing, saving and printing of documents with shortcuts; Text creation and manipulation – cut, copy, paste, redo and undo with shortcuts, Insert Ribbon – Illustrations, header & footer, symbols.
12.	Formatting of text; Table handling- insertion, deletion, alignment; Find and replace; Spell check.
13.	MS Excel basics -Creating, displaying the screen, identifying the components; Opening, saving, retrieving and closing spreadsheet.
14.	Formulas: Auto sum -Sum, Average, Count numbers, Min and Max; Create a line, bar and pie chart/graph.
15.	MS PowerPoint – Creating, Opening and Saving a presentation; Working with slides – insert, delete, layout; Insert: picture, clipart, smart art and shapes.
16.	Slide view – normal, slide sorter, slide show and handouts; Animations – slide and text transition.
17.	**Final Practical Examination.**

Course Outcome

Students will have basic understanding of the role of computers in Agriculture and allied area. They will acquire knowledge on complete application of different softwares in developing their computer usage skills.

Text book

1. **Computer Basics**: Absolute Beginners Guide, Michael Miller, 8th Edition, Que Publication
2. **Learning Computer, Fundamentals, MS Office and Internet & Web Technology**, Third Edition, Firewall Media Publication

References

1. Introduction to Computer Fundamentals, Bright SiawAgrijie , Second Edition, Trafford Publication
2. Basic Computer for Beginners, Web Wise Seniors, 2003
3. Learning MS Word and MS Excel – 2010, RohitKauraha

E References

https://www.tutorialspoint.com/computer_fundamentals/

http://www.klientsolutech.com/uses-of-microsoft-office-applications-in-daily-life/

LAN D11	English Language for Effective Communication	(0+1)

Objectives

To make the students competent in day–to-day and professional communication skills *viz.,*

- ❖ Listening to comprehend information
- ❖ Listening to take notes
- ❖ Speaking in personal and official contexts with clarity and confidence
- ❖ Delivering short speeches
- ❖ Application of Reading Techniques
- ❖ Reading for information and for note making
- ❖ Application of professional writing skills
- ❖ Participation in Group Discussion and Interviews

Practical syllabus

LISTENING: Introduction to listening - – listening comprehension – note taking- Listening to dialogue and summary making

SPEAKING: Introduction to speaking - Dialogue and Conversation - Principles of speech preparation- Presentation skills - self introduction - short speech (impromptu) - Professional speaking - welcome address & vote-of-thanks

READING: Reading techniques – SQ4R - skimming and scanning –Note-making & précis writing - Sentence completion & Sentence correction for competitive examinations

WRITING: Dialogue writing &paragraph writing - Essay writing – Graham's flowchart - Letter writing – personal and official letter writing.

INTEGRATED SKILLS: Professional presentation skills – Group Discussion –Resume writing – Interview skills

Practical Schedule

Ex.No.	Contents to be dealt
1.	Introduction to listening – listening comprehension listening to IELTS audio/ video – note taking
2.	Principles of dialogue - Listening to dialogue – Practicing and summary making
3.	Introduction to speaking - Dialogue and Conversation - Principles of speech preparation- select speeches of eminent oratory (Martin Luther King's I Have a Dream/ Winston Churchil's We Shall Fight on the Beaches/

	Bernard Shaw's Spoken English and Broken English etc.)
4.	Presentation skills - self introduction - short speech (impromptu)- preparation of model speeches and demonstration
5.	Professional speaking one minutes speech and presentation - welcome address & vote-of-thanks
6.	Reading techniques – SQ4R application on a select essay- skimming and scanning – application by reading a select passages/ essay –classroom activities
7.	Note-making & précis writing- demonstration and exercise
8.	Sentence completion & Sentence correction for competitive examinations – worksheets from a select guide of a competitive examination
9.	**Mid semester Practical Examination.**
10.	Dialogue writing & paragraph writing – exercises- analysis of select dialogues and paragraphs - Practicing
11.	Essay writing – Graham's flowchart- application of the flow chart on a model essay followed by exercises
12.	Letter writing – personal and official letter writing – study of select letters (e.g. Personal invitation, request letters, complain letters, job application)- exercises
13.	Professional presentation skills – study of model presentation from TED talks - classroom activity
14.	Group Discussion – presentation; Resume writing- study of select resumes and their components
15.	Exercise on preparing Resume of the individual student.
16.	Interview skills –preview of recorded interviews – study of principles – conduct of mock interview
17.	**Final Practical Examination**

Course Outcome

The students will be familiarized with speaking, listening, writing and reading skills in English and improve their presentation skills.

Text Books

1. Hariharan,S. *et al.,English for Effective Communication*. Coimbatore, Thannambikkai publications, 2014. Third edition.
2. Hariharan,S. *et al.,* Soft Skills. Chennai, MJ Publishers, 2009.

References

1. Goodale, Malcolm, *Professional Presentations,* Cambridge University, 2005.
2. Greenbaum Sidney, *Oxford English Grammar*, New Delhi, Oxford University Press. Peregoy, 2009.
3. Jones Daniel, *English Pronouncing Dictionary*, Cambridge University Press,2006.

4. Krishnaswamy. Modern English A Book of Grammar Usage and Composition, Chennai,Macmillan India Limited, 2010.
5. Murphy, Raymond. Intermediate English Grammar, Cambridge University Press; Second edition 1999)
6. Sundararajan, N, *Attentive Listening: How it Matters*, University News, March 19-25, 2005.

PED D11	PHYSICAL EDUCATION	(0+1)

Practical Syllabus

17 Practical classes for each semester – 2 ½ hours each class (17 x 2½ = 42 ½ hours) – 17 classes will be converted into 40 practical hours and 2 ½ hours for evaluation

I Semester (20 Hours)

Exercises for strength, agility, co-ordination, flexibility, co-operation, vital capacity endurance, speed and for various systems of our body and team spirit.

Exercise for good posture – conditioning and calisthenics for various athletic activities *i.e. (*a) before start – arm stretch, hand stretch and cat stretch (b) loosening up jogging, bending and twisting (c) standing – lateral arc, triangle and hands to feet pose (d) sitting – camel kneel, spinal twist and supine knee bend (e) relaxation – the corpse pose, quick and deep relaxation. Basic Gymnastic exercises.

Participation of athletic events – Track & Field events: Track events: short distance, middle distance, long distance, relay race. Field events such as Long jump, High jump, Triple jump, Pole vault, Shot put, Discus, Hammer, and Javelin throw.

Skill development in anyone of the following games

Warming up, general and specific warming up Stretching exercises lead up games, advanced skill for all the games.

- **Basket Ball**: Dribbling, pass, two or three men pass, pivot, lay up shot, shooting, pass break, hook pass, screening, positional play, defense and offence tactics.
- **Volley Ball**: Fingering, under arm pass, overhead pass, setting, spiking, back pass, jump pass, stunts, elementary dive, flaying dive, roll, blocking and various types of services like under arm service, Tennis service, and jump service.
- **Ball Badminton**: Grip, service, foot work, fore hand stroke, back hand stroke, lob, smash, volley, wall practice, and spin service and defense tactics.
- **Football**: Dribbling, passing, dodging, kicking, heading, screening, chest pass, throwing, dragging, goal kick, defense and offence tactics.
- **Hockey**: Grip, bully, dribbling, hitting, drive, push strokes, scoop, flick, stopping, various types of passes, dodging, defence and offence tactics.
- **Kho-Kho**: Quadra ped, bi-ped, how to given kho, taking a direction, recede, parallel toe method, bullet tow method, distal method, foot out, dive, ring game, chains and persue and defense skills.
- **Chess**: Moves, move of king, move of pawns, move of rooks, move of bishops,

move of queen, move of knights, en passant, castling, check and notation.

- **Kabaddi**: Raid, touch, cant, catch, struggle, various types of defense and offence tactics.
- **Cricket**: Grip, bowling, spin, leg spin, off spin, medium, batting, dive, sweep, mode of delivery, fielding, rolling etc.
- **Tennis**: Grip, forehand drive, back hand drive, stroke, backhand ground stroke, service, volley, smash, wall practice, foot work, defense and offence tactics.
- **Table Tennis**: Grip, tossing and serving, spin serve, rally, smash, flick, and defense and offence tactics.
- **Shuttle Badminton**: Grip, foot work, service, setting, smash, volley, forehand and back hand stroke, back hand serve and defense.
- Formation of pyramids

Yoga and meditation

Aims and objectives of yoga –for ailments, back pain, arthritis, abdominal problems, stress, fatigue, insomnia, obesity, circulation, hypertension, varicose veins, respiration, heart, digestion, headache, depression, addiction and eye problems.

Mental balance and importance development of concentration suriyanamaskar, pranayamam meditation – advance skills of any one of the games which were taught for the first semester.

1. Prayer 2. Surinanamaskar (12 steps) 3. Pranayamam (Breathing exercise) 4. Asanas (20 asanas) 5. Meditation 6. Closing prayer.

Standing Asanas: Veerabhatrasan, praiasan, paathakasthasan, Tadasan, Vrkisasan. Thirigonasana.

II Semester (20+ 2 ½ hours)

Athletics (Track & Field)

A.Track events

a. **Sprint event**: Bullet start, Medium start, elongated start, set, pick up, finish, upsweep, down sweep, placement, receiving and exchanging. Skills & Techniques: Effective starting, acceleration, stride length, Finish. (100, 200, 400 Mts)
b. **Middle distance** :(Arc start) Effective start, acceleration, maintain the speed, finish. (800, 1500 Mts)
c. **Long distance**: (Arc start) Effective start, acceleration, maintain the speed and endurance, finish. (5000, 10,000 Mts)
d. **Hurdles** (100, 110, 400 Mts) crouch start (Effective start, clearance the

hurdles, maintain the speed, Finish.

e. **Relay race** (4x100, 4x400 Mts) (Effective start, Acceleration speed, clearance the hurdles, maintain the speed, Finish.
f. **Marathon** (42.195 Mts(Full marathon), 21.1 km (Half marathon)

B. Field events

1. Jumps (Long jump, High jump, Triple jump, pole vault**)**

i. **Long jump Skills**: Approach run, take-off, Body in the air (hitch-kick, hanging), Landing. Speed, explosive power.
ii. **High jump Skills**: approach, take off clearance, landing, Western roll, belly roll, eastern cut off, fass ferry flop.
iii. **Tripple jump:** Approach run, take-off, Body in the air (hitch-kick, hanging), Landing. Speed, explosive power.

2. Throws: Shot put, Discus, hammer, and javelin. Grip, momentum, pre shift, sub phase, the wind up, foot work, entry to the turn, shift, angle of release, follow throw, delivery, front cross step, rear cross step, hop step, fuck method parry obraine, disco put, rotation, carry and glide.

3. Combined events:

a. Pentathlon (5 events)
b. Heptathlon (7 events)
c. Decathlon (10 events)

Yoga and meditation

I. **Sitting Asanas:** pathmasana, vajrasana, Janusirasasan , paschimotasan , Arthamatchindrasan, Komukasan
II. **Prone posture:** Bhujangasan, salabasan, Yanasan, Dhanurasan, Arthasirasasan.
III. **Supine posture:** Uthanapadasan, Navukasan, pavana mukthasan, vibarithakarani, Halasan.

Outcome

Participation in various tournaments and coaching camps, developing leadership qualities by organizing matches intramural and extramural and friendly matches.

TAMIL NADU AGRICULTURAL UNIVERSITY

DIPLOMA IN AGRICULTURE

II Semester

S. No.	Course No.	Course Title	Credit Hrs.
1.	AGR D13	Agronomy of Field Crops- I	1+1
2.	STH D11	Seed Production Techniques in Field Crops	1+1
3.	HOR D12	Vegetable and Fruit culture	2+1
4.	AEN D11	General and Economic Entomology	2+1
5.	PAT D11	Principles of Plant Pathology	1+1
6.	SAC D12	Soil Nutrient Management	1+1
7.	ENS D11	Energy and Environment	1+1
8.	PED D11	Physical Education	-
		Total	**9+7=16**

Note: PED D11 course evaluation will be done at the end of second semester

AGR D13	Agronomy of Field Crops- I	(1+1)

Objective

To learn the package of practices of Cereals, Millets and Pulses including Rice, Wheat, Maize, Sorghum, Sweet sorghum, Cumbu, Ragi, Minor millets,Red gram, Green gram, Black gram, Soybean, Cowpea, Bengal gram and Horse gram, Cereals and pulses based cropping system

Theory Syllabus

Agronomic Practices including Climatic and Soil Requirement, Land Preparation – Seeds and Sowing – Varieties – Irrigation and Fertilizer Management – Irrigation – Weed Control –intercultural operations- Harvesting – Cropping Systems for Cereals, Millets, Pulses.

Theory Schedule

Lecture No.	Content to be taught
1.	Agronomic practices for rice - climatic - soil - land preparation – seeds and sowing- varieties.
2.	Agronomic practices for rice - irrigation - fertilizer management - weed management –intercultural operations- harvesting.
3.	Agronomic practices for rice – method of establishment – transplanting(conventional, SRI), machine transplanting, wet seeding, dry seeding and semidry rice.
4.	Agronomic practices for wheat - climatic - soil - land preparation – seeds and sowing- varieties - irrigation - fertilizer management - weed management –intercultural operations- harvesting.
5.	Agronomic practices for maize - climatic - soil - land preparation – seeds and sowing- varieties - irrigation - fertilizer management - weed management –intercultural operations- harvesting.
6.	Agronomic practices for sorghum - climatic - soil - land preparation – seeds and sowing - varieties - irrigation - fertilizer management - weed management –intercultural operations- harvesting - sorghum effect – sorghum poisoning – rainfed sorghum – ratoon sorghum.
7.	Agronomic practices for sweet sorghum - climatic - soil - land preparation – seeds and sowing- varieties - irrigation - fertilizer management - weed management –intercultural operations- harvesting.
8.	Agronomic practices for cumbu - climatic - soil - land preparation – seeds and sowing- varieties - irrigation - fertilizer management - weed management –intercultural operations- harvesting.
9.	**Mid Semester Examination**
10.	Agronomic practices for ragi - climatic - soil - land preparation – seeds

	and sowing- varieties - irrigation - fertilizer management - weed management –intercultural operations- harvesting
11.	Agronomic practices for minor millets, tenai, samai, varagu, panivaragu and kudiraivali - climatic - soil - land preparation – seeds and sowing- varieties - irrigation - fertilizer management - weed management – intercultural operations- harvesting.
12.	Agronomic practices for red gram - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management - intercultural operations- harvesting.
13.	Agronomic practices for black gram and green gram - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management – intercultural operations - harvesting.
14.	Agronomic practices for cowpea - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management – intercultural operations - harvesting.
15.	Agronomic practices for soybean - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management – intercultural operations - harvesting.
16.	Agronomic practices for bengal gram and horse gram - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management – intercultural operations - harvesting.
17.	Cereals, millets and pulses based cropping system – relay cropping – sequential cropping - intercropping.

Practical Syllabus

Preparation of Nursery for rice – Various Methods of Nursery preparation – Varieties for different seasons – Utilization of Bio-fertilizers in Rice crop production.Seed Treatment for different crops - Cereals, Millets and Pulses.Practicing Field Preparation and Sowing of Cereals, Millets and Pulses.– Studying Cost of Cultivation for important crops.

Practical Schedule

Ex.No	Content to be taught
1.	Establishing crop cafeteria involving major crops – cereals, millets and pulses.
2.	Identification of crops and varieties of cereals, millets and pulses.
3.	Working out nursery area requirement for transplanted crops.
4.	Practicing nursery preparation for irrigated lowland and upland.
5.	Practicing main field preparation for irrigated lowland and upland.
6.	Practicing transplanting with optimum aged seedling.
7.	Practicing different sowing methods for irrigated uplands.
8.	Practicing seed treatment and hardening for rainfed crops.

9.	**Mid Semester Practical Examination**
10.	Estimation of plant population per unit area for important crops.
11.	Practicing foliar spray of DAP and pulse wonder to pulses.
12.	Practicing manual and mechanical weeding in irrigated lowland and upland.
13.	Recording biometric observation on growth parameters of Cereals and Pulses.
14.	Recording biometric observation on yield parameters, assessing maturity and estimation of yield of cereals and pulses.
15.	Visit to nearby research station/ guest lecture.
16.	Working out cost of cultivation and economics of important crops – rice, maize, black gram and red gram.
17.	**Final Practical Examination**

Course Outcome

Learning agronomic practices and acquiring skill by practicing the techniques.

References / Text Books

Crop production guide. 2012. Tamil Nadu Agricultural University and Department of Agriculture, Government of Tamil Nadu.

http://agritech.tnau.ac.in– TNAU Agritech portal.

Sankaran, S. and V.T. SubbiahMudaliar. 1997. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

STH D11	Seed Production Techniques in Field Crops	(1+1)

Theory Syllabus

Introduction to seed production

Seed - Importance - Seed Quality Characteristics - Difference between seed and grain- Difference between varieties and hybrid seed production-Generation system of seed multiplication - Nucleus, Breeder, Foundation and Certified Seed - Seed Multiplication Ratio (SMR) – Seed Replacement Rate (SRR)-Guidelines for Seed Production – Agronomic and Genetic principles-Floral biology – Pollination and Role of Insects on seed production

Seed production in important agricultural crops

Seed Production Techniques for Varieties and Hybrids in Rice-Seed Production Techniques for Varieties and Hybrids in Sorghum, Cumbu and Maize-Seed Production Techniques for Varieties and Hybrids in Pulses and Oilseeds-Seed Production Techniques for Varieties and Hybrids in Cotton

Seed production in important Horticultural crops

Seed Production Techniques for Varieties and Hybrids in Tomato, Brinjal, Chillies and Bhendi-Seed Production Techniques in varieties and hybrids of Cucurbits (Pumpkin, ashgourd, bittergourd, snake gourd, ribbedgourd and cucumber)

Harvest and post harvest techniques in seed production

Physiological maturity indices-Harvesting methods-Seed drying –Seed Processing - cleaning -grading- upgrading-Seed treatment - Seed Packaging and seed storage

Seed certification and seed quality regulation

Seed certification Phases– procedures - Field Inspection for Certification – Field and Seed Standards-Seed Village Concept-Seed Act, Rules and seed law enforcement - duties and responsibilities of seed inspector-Seed marketing - Factors influencing seed marketing

Lecture schedule

Lecture No.	Contents to be taught
1	Seed - Importance - Seed Quality Characteristics - Difference between seed and grain - Difference between varieties and hybrid seed production
2	Generation system of seed multiplication - Nucleus, Breeder, Foundation and Certified Seed - Seed Multiplication Ratio (SMR) – Seed Replacement Rate (SRR)
3	Guidelines for Seed Production – Agronomic and Genetic principles
4	Floral biology – Pollination and Role of Insects on seed production

5	Seed Production Techniques for Varieties and Hybrids in Rice
6	Seed Production Techniques for Varieties and Hybrids in Sorghum, Cumbu and Maize
7	Seed Production Techniques for Varieties and Hybrids in Pulses and Oilseeds
8	Seed Production Techniques for Varieties and Hybrids in Cotton
9	**Mid Semester Examination**
10	Seed Production Techniques for Varieties and Hybrids in Tomato, Brinjal, Chillies and Bhendi
11	Seed Production Techniques in varieties and hybrids of Cucurbits (Pumpkin, ashgourd, bittergourd, snake gourd, ribbedgourd and cucumber)
12	Physiological maturity indices-Harvesting methods
13	Seed drying –Seed Processing - cleaning -grading- upgrading
14	Seed treatment - Seed Packaging and seed storage
15	Seed certification phases – procedures - Field Inspection for Certification – Field and Seed Standards-Seed Village Concept
16	Seed Act, Rules and seed law enforcement - duties and responsibilities of seed inspector
17	Seed Marketing - Factors influencing seed marketing

Practical Syllabus

Identification of different crop seeds-Seed quality enhancement techniques - Seed dormancy breaking, seed priming, pelleting and polymer coating-Synchronization techniques for hybrids-Emasculation and dusting - detasselling techniques -Field counting procedures in seed certification - Identification of off types pollen shedders, shedding tassels and rogueing-Threshing, seed extraction and grading methods-Visit to seed production plots and seed processing unit-Seed sampling - mixing and dividing-Physical purity analysis-Seed moisture estimation-Germination test and seedling evaluation-Conducting quick viability test-Seed health testing-Visit to Department of Seed Certification phases and Seed Testing Laboratory-Estimation of economics of seed production

Practical schedule

Ex No.	Content to be taught
1	Identification of different crop seeds
2	Seed quality enhancement techniques - Seed dormancy breaking, seed priming, pelleting and polymer coating
3	Synchronization techniques for hybrids
4	Emasculation and dusting - detasselling techniques
5	Field counting procedures in seed certification - Identification of off types pollen shedders shedding tassels and rogueing
6	Threshing, seed extraction and grading methods
7	Visit to seed production plots and seed processing unit
8	Seed sampling - mixing and dividing

9	**Mid Semester Practical Examination**
10	Physical purity analysis
11	Seed moisture estimation
12	Germination test and seedling evaluation
13	Conducting quick viability test
14	Seed health testing
15	Visit to Department of Seed Certification and Seed Testing Laboratory
16	Estimation of economics of seed production
17	**Final Practical examination**

Course outcome

The students will be familiarized with production, management and post harvest technologies in seed production of various field crops.

References

1. Gregg, B.G., A.G. Law., S.S. Virdi and J.S. Balis. 1970. *Seed Processing*. National Seed Corp., New Delhi.
2. Agrawal, R.L. 1996. Seed Technology, Oxford & IBH Publishing Co., New Delhi.
3. Copeland, L.O. 1988. Principles of seed science and technology. Surjeet Publications, New Delhi.
4. Bhaskaran, M. *et al.,* 2004. Principles of seed production. Scientific Publishers, Ludhiana.
5. Umarani, R., R. Jerlin., N. Natarajan., P. Masilamani and A.S. Ponnuswamy. 2006. *Experimental Seed Science and Technology.* Agrobios (India), Jodhpur.
6. Trivedi RK and Gunasekaran M. 2014.Compendium on seed legislations. Seeds Division, DAC, MoA, GoI, New Delhi

HOR D12	Vegetable and Fruit Culture	(2+1)

Objective

To understand the production and management aspects of vegetable and fruit cultivation

Theory syllabus

Importance of vegetables – nutritive value – types of vegetable garden: kitchen garden/ nutrition garden, truck garden and market garden (commercial garden) – soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, harvesting, yield and post harvest handling of tomato, brinjal, chillies, bhendi, onion, cucurbits(gourds); temperate vegetables like cauliflower, cabbage, turnip, knolkhol - salad vegetables (Cucumber, Lettuce, Celery); root (tapioca and yam) and tuber vegetables (potato and sweet potato); Greens (amaranthus) and perennials (moringa)- Physiological and nutritional disorders and their corrective measures- Tissue culture achievements in major vegetable crops.

Study of cultural practices of the following fruit crops with reference to soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage. Tropical fruits: mango, banana, grapes, papaya, sapota, guava, citrus (acid lime, mandarin orange & sweet orange), pomegranate, ber, annona, aonla and jack. Subtropical and temperate fruits: apple, pear, peach, plum and pineapple.

Theory schedule

Lecture No.	Contents to be taught/ Dealt
1	**Importance of vegetables and its nutritive value** Scenario of vegetable production in Tamil Nadu-Recommended Dietary Allowance of vegetables recommended by ICMR - composition of nutrient, vitamins and minerals of different vegetable crops
2	**Types of vegetable garden : Kitchen/Nutritional garden, truck garden & market garden (commercial garden)** Kitchen/nutrition garden - Selection of site - Principles in layout – cropping arrangements - Importance of truck garden and market garden (commercial garden)
3	**Cultivation practices of tomato** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling.

4	**Cultivation practices of brinjal** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling.
5	**Cultivation practices of chillies** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
6	**Cultivation practices of bhendi** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
7	**Cultivation practices of Onion, Turnip, Knol-khol** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
8	**Cultivation practices of gourds** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
9	**Cultivation practices of cauliflower and cabbage** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
10	**Cultivation practices of potato and sweet potato** Soil and climatic requirements, varieties and propagation, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
11	**Cultivation practices of tapioca and yam** Soil and climatic requirements, varieties and propagation, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
12	**Salad vegetables cultivation practices (Cucumber, Lettuce, Celery)** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
13	**Cultivation practices of greens (amaranthus)** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting, yield and post harvest handling
14	**Cultivation practices of perennials (moringa)** Soil and climatic requirements, varieties, cultural practices, manuring, irrigation, weeding – use of growth regulators, maturity indices, harvesting,

	yield and post harvest handling
15	**Physiological and nutritional disorders and their corrective measures of major vegetables** Symptoms of nutritional and physiological disorder - management aspects - major vegetable crops
16	**Tissue culture achievements in vegetables** Mass multiplication of commercial vegetables – Drought tolerant/Heat tolerant – Disease/pest resistance (Biotic & Abiotic stresses)
17.	**Mid semester examination**
18.	**Cultural practices of mango** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning
19.	**Cultural practices of mango** role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
20.	**Cultural practices of banana** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders
21.	**Cultural practices of banana** Role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
22.	**Training and pruning techniques in horticultural crops** Difference between training and pruning - Different methods of training in horticultural crops- Different methods of pruning in horticultural crops
23.	**Cultural practices of grapes** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
24.	**Cultural practices of papaya** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage – uses and extraction of papain
25.	**Cultural practices of sapota** Soil, climate, varieties, Propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
26.	**Cultural practices of guava** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post

	harvest technology – grading – packing – storage
27.	**Cultural practices of acidlime, mandarin orange and sweet orange** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
28.	**Cultural practices of pomegranate** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
29.	**Cultural practices of ber and annona** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
30.	**Cultural practices of aonla and jack** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
31.	**Cultural practices of apple, pear** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
32.	**Cultural practices of plum, peach** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
33.	**Cultural practices of Pine apple** Soil, climate, varieties, propagation, cultural, manurial, horticultural and irrigation practices – physiological and nutritional disorders - training and pruning – role of growth regulators – maturity standards – methods of harvesting – yield and post harvest technology – grading – packing – storage
34.	**Physiological and nutritional disorders and their corrective measures of major fruits** Symptoms of nutritional and physiological disorder - management aspects

Practical syllabus

Preparation of nursery bed –protray nursery seedling production-preparation of main field and forming beds, ridges and furrows – methods of fertilizer application – irrigation systems: drip and sprinkler irrigation – herbicide application-growth regulator application- layout of pandal and training of gourds - maturity indices and harvesting vegetables

Layout of orchard - methods of planting – sucker treatment in banana-methods of irrigation- methods of fertilizer application-training and pruning of different fruit crops – harvesting of fruits.

Practical schedule

Ex. No.	Contents to be taught/ Dealt
1.	**Preparation of raised nursery bed, manure application and working out seed requirement** Nursery -Advantages of sowing seeds in nursery -Types of nursery bed (Flat bed, raised bed)- Advantages of raised nursery bed-Procedure for preparation of raised bed and sowing-Line sowing – Mulching- Advantages-Seed requirement formula- seed rate for different vegetable crops
2.	**Protray seedling production and preparation of main field for vegetables (bed, ridges and furrows)** Protray seedling production-Advantages of seedling production through pro trays- Media for portray-Sowing of seed and management - Different means of field preparation (Digging, Ploughing, Harrowing, Rolling)
3.	**Practicing seed and seedling treatment for various vegetable crops** Seed treatment – Chemicals & bio fertilizer or bio control agent - Sowing of seeds in the nursery -Broadcasting method- Line Sowing- Seedling treatment - Hardening of seedlings - Dipping of seedlings in a starter solution
4.	**Methods of manuring for transplanted and direct sown vegetable crops** Manures – Definition - Role of organic manures – FYM, Green manure & green leaf manure – Inorganic manure (Nitrogenous fertilizer, Phosphate fertilizers, Potassic fertilizers, Mixed fertilizers)- Biofertilizers or bio-inoculants- Time of application- Methods of application of manure (Broadcasting as a basal dressing, Broadcasting as top dressing), Starter solution, Foliar application, Application through irrigation
5.	**Drip and sprinkler irrigation layout for vegetable crops** Definition -Drip Irrigation System Layout and Components-Suitable crops - Suitable irrigation water- Modifications of drip irrigation system-Advantages& disadvantages - Sprinkler irrigation or Overhead irrigation
6.	**Practicing herbicide and growth regulators application for direct sown and transplanted vegetable crops** Herbicides-Definition-Precautions during herbicide application- Benefits of herbicide use-Two types of herbicides (Selective herbicides & Non-selective

	herbicides)- Herbicide recommendation for vegetable crops-Herbicide calculation with example - Growth regulator -Classification of plant growth regulators - List of growth regulators-Growth regulators uses in vegetable production- Methods of application of plant growth regulators
7.	**Practicing top dressing application** Top dressing recommendations for different vegetable crops
8.	**Pandal layout and training of gourds** Advantages of raising gourds in pandal system than other methods
9.	**Mid semester practical examination**
10.	**Layout of orchards for different fruit crops** Planning, Laying out of Orchards - Vertical row planting pattern (Square system, Rectangular system, Cluster system) - Alternate row planting pattern (Hexagonal System, Diagonal or Quincunx system, Triangular system, Contour system)
11.	**Practicing planting of mango, sapota and guava** Important points to be considered before planting of fruit trees, Method of taking pits, Pit size, Spacing of crop – System of planting (Square or rectangular system)
12.	**Practicing banana sucker preparation and sucker treatment for planting** Selection of Planting Material- Pre treatment of suckers (Paring and Pralinage)
13.	**Working out fertilizer requirement for important fruit crops** Conversion factor for chemical fertilizers –fertilizer calculation
14.	**Study of varieties of mango, banana, papaya, guava and sapota** Characters of different mango, banana, papaya, guava and sapota varieties
15.	**Fertigation systems : Study of components and scheduling** Definition-Advantages of drip fertigation- Characteristics of fertilizers for fertigation- Sources of nutrients- Precautions to be taken during fertigation - Time of application- Fertigation equipments
16.	**Training and pruning of different fruit crops** Training- Objective of training- Details of training (Height of head,Number of scaffold limbs, Distribution of scaffold limbs)- Methods of leader training (Open Centre, Central Leader, Modified leader)- Systems requiring the support of the structures (Bower system, Espalier system, Kniffin system, Telephone system, Tatura trellis) Pruning-objectives- Season of Pruning-Special pruning techniques (Root Pruning, Ringing, Notching, Smudging, Bending ,Coppicing, Pollarding, Lopping, Pinching, Disbudding, Thinning**)**
17.	**Final practical examination**

Course outcome

The students will be familiarized with production and management technologies of vegetable and fruit cultivation

References/ Text books

A guide on vegetable culture, 3rd Edition, 2000. D.Veeraragavathatham, M.Jawaharlal, Seemanthini Ramadas, Suri Associates, Coimbatore.

www.tnau.ac.in

Scientific fruit culture, 2nd Edition, 2004. D.Veeraragavathatham, M.Jawaharlal, S.Jeeva, R.Rabindran, G.Umapathy, Suri Associates, Coimbatore.

AEN D11	General and Economic Entomology	(2+1)

Objective

To understand the basic insect body structures and functions, collection, economic importance of insects, various pest control methods, pesticides, application methods, safe handling and antidotes.

Theory syllabus

Insects - Characters of an insect - Dominance of insects; types and modifications of mouth parts, wings and legs. Economic classification of insects. Sericulture; Mulberry cultivation and Rearing of Mulberry silk worm. Apiculture – bee species, castes and their duties- Hiving of bees and Apiary management. Beneficial insects- Insect Pollinators, Predators and Parasitoids. Pest; Categories of pests- Pest outbreak- Pest Monitoring- Pest surveillance- Forecasting- Economic Threshold Level- Economic Injury Level. Pest Management Components - Cultural, Physical, Mechanical, Legal, Host plant resistance, Biological control-parasitoids, predators and microbial agents. Chemical control -Pesticides- groups, classification, formulation and uses. Pesticides application methods and appliances. Hazards in the use of pesticides and environmental pollution- safe handling of pesticides- pesticide residue- resistance and resurgence. Behavior modifying chemicals- use of pheromones in pest management; field pest problem approaches.

Theory schedule

Lecture No	Contents to be taught/ Dealt
1.	Insect - characteristics of an insect, dominance of insects - factors responsible for dominance *viz.,* Capacity for flight, more adaptability or universality, smaller size, presence of exoskeleton, tracheal system of respiration, higher reproductive potential, presence of complete metamorphosis, presence of defense mechanisms, hexapod locomotion.
2.	Insect mouth parts and their modifications *viz*., Biting and chewing type and piercing and sucking (bug type) in detail, chewing and lapping type, rasping and sucking, mandibulosuctorial type, sponging type and siphoning type of mouth parts with examples.
3.	Insect wings; Structure and their modifications *viz.*, Membranous, Tegmina, elytra, hemelytra, halteres, fringed and scaly wings. Insect legs; Structure and their modifications *viz*., Ambulatorial, cursorial, fossorial, saltatorial, scansorial, raptorial, foragial and natatorial.
4.	Economic classification of insects and their importance - Representation by flow chart *viz*., harmful insects (Insect pests of field, horticultural and forest crops, insect pests of storage products, household pests, insect

	inimical to man and animals) and beneficial insects (Products from secretion of insect, products from collection and storage of plant products by the insects, bodies useful as or contain substance, insects used as food, helpful insect).
5.	Sericulture - mulberry cultivation practices (Climate requirement, rain fall and soil) varieties - pests and diseases of mulberry. Silkworm - types of silkworm (Mulberry silkworm, tasar silkworm, muga silkworm and eri silkworm), mulberry silkworm races (Univoltine, bivoltine and multivoltine) and their characters. Structure of silk gland and composition of silk.
6.	Rearing of mulberry silk worm and improved methods *viz*., Types of chawki rearing (Paraffin paper rearing, box rearing and cooperative rearing) and types of late age worm rearing (Shelf rearing, floor rearing and shoot rearing). Types of mountage, disinfectants, pest and diseases of silk worm.
7.	Apiculture - Different Bee species (Indian bee, Italian bee, rock bee, little bee and dammer bee), castes and duties of castes in honey bee colony.
8.	Hiving of bees and Apiary management practices *viz*., Hive inspection, management of bee colonies during lean season (Sugar feeding and uniting of bee colonies) and honey flow season (Supering, honey extraction and swarm management).
9.	Important pests of honey bees (Greater wax moth, lesser wax moth, bee hunter wasp, yellow banded wasp, ants, termite, lizard, king crow *etc*.). Bee diseases - brood diseases (American foul brood, European foul brood, sac brood, tai sac brood and fungal) and adult diseases(acarine, Nosema and amoebic).
10.	Beneficial insects- important predators (Monophagous predators, oligophagous predators) like green lace wings, lady bird beetles, assassin bug, syrphid, dragon fly and praying mandits, *etc.* Parasitoids- types of parasitism (Simple parasitism, super parasitism, multiparasitizm and hyperparasitism) and types of parasitoids (egg parasitoids, egg larval parasitoids, larval parasitoids, pupal parasitoids and adult parasitoids with examples). Insect pollinators (Honey bee in detail, butterflies, oil palm weevil, fig wasp, bumble bees and hoverflies).
11.	Pest-definition-categories of pests based on occurrence, based on level of infestation and based on the loss; causes of pest outbreak *viz*., deforestation of forest and bringing them under cultivation, destruction of natural enemies, intensive and extensive cultivation, introduction of new varieties and crops, improved agronomic practices, introduction of new pest in new environment and accidental introduction of pests from foreign countries.
12.	Pest monitoring - importance of monitoring, monitoring techniques and

	procedures Pest Surveillance – Objectives of pest surveillance programme, survey methods and sampling techniques. Pest forecasting - types of pest forecasting and Decision Making.
13.	Economic Injury Level and Economic threshold level- differences, factor influencing ETL- ETL for major crop pests.
14.	Integrated pest management-Definition, need and objective for pest management. Components of pest Management *viz*., cultural, host plant resistance, physical, mechanical, biological, chemical, behavioural, genetic and legal method of pest control.
15.	Cultural methods of pest control - Farm level practices (Summer ploughing, puddling, pest free seed materials, high seed rate, detrashing, early sowing, plant density, earthing up, destruction of weed hosts *etc*.) and Community level practices. Merits and demerits of cultural control.
16.	Physical methods of pest control *viz*., manipulation of temperature, manipulation of moisture, manipulation of light, manipulation of air, use of irradiation, use of abrasive dusts and use of greasing materials. Merits and demerits of physical control.
17.	**Mid semester Examination**
18.	Mechanical methods of pest control - manual force (Hand picking, beating and swatting, sieving and winnowing, passing rope across rice field, hooking with iron rod, crushing, combing and brushing) and mechanical force (Entoleter, hopper dozer, tillage implements, mechanical traps). Appliances in controlling the pests *viz*., light traps, pheromone traps, yellow sticky trap, bait trap, fish meal trap and pitfall trap. Merits and demerits of mechanical control.
19.	Legal methods of pest control - Pests accidentally introduced into India, foreign pest from which India is free; Quarantine, plant quarantine, different classes of quarantine and pest legislations, Insecticide Act and phytosanitary certificate.
20.	Host plant resistance - Types of resistances - Based on number of genes (monogenic, oligogenic and polygenic), based on biotype reaction (Vertical and horizontal resistance); mechanisms of resistance (Antixenosis, antibiosis and tolerance); use of resistant varieties for pest management, compatibility of HPR in IPM. Merits and demerits of HPR.
21.	Biological control methods – concepts of biological control (Conservation, introduction and augmentation).Role of predators in pest management of major crops with classical examples, dose and time of release.
22.	Role of parasitoids in pest management of major crops with classical examples, dose and time of release. Merits and demerits of biological control.
23.	Microbial control - Definition, Classical examples for viruses (Nucleo Polyhedrosis Virus, Granulosis Virus and Cytoplasmic Polyhedrosis

	Virus), bacteria (obligate and facultative bacteria), fungi (Green muscardine, white muscardine, white halo and *Hirsutella thompsoni*), protozoans (*Nosema heliothidis*) and nematodes (DD 136) in pest management.
24.	Chemical control - Classification of pesticides based on target organisms (Insecticides, rodenticides, acaricides, avicides,molluscicides, nematicides, fungicides, bactericides, herbicides). Classification of insecticides based on mode of entry (Stomach poison, contact poison, fumigant and systemic poison) and mode of action (Physical poison, protoplasmic poison, respiratory poison, nerve poison and chitin inhibitor). Ideal qualities of an insecticide.
25.	Insecticide groups – organic and inorganic compounds (Chlorinated hydrocarbon, organophosphorus, carbamates and synthetic pyrethroids). newer insecticides molecules- neo nicotinoids, avermectins, spinosyns, cartap hydrochloride, amides, *etc*.
26.	Insecticide formulations – ingredients in the formulation and their role with examples - Dust, granule, Wettable powder, Emulsifiable Concentrates, soluble powder, flowable, soluble liquid, wettable granules, dispersable granules, gas or vapour, smoke generator, aerosols, poison baits, seed dresser, tablets, encapsulated fumigants and their uses.
27.	Acaricide, Rodenticides, Molluscicides and Nematicides with examples in pest management. Preparation of baits for rat management.
28.	Hazards in the use of pesticides and environmental pollution - hazards to man, soil and environment – Biomagnification due to insecticides.
29.	Pesticide residues-Toxicity on non target organisms, MRL and ADI. Insecticide resistance, insecticides resistance reported in insect pests in India, resurgence, secondary pest out breaks and impact of global warming on pests.
30.	Safe handling of pesticides - storage of pesticides, personal protective equipment, safety in application of pesticides, pesticide selection, safety before application, safety during application, safety after application, first aid and antidotes for pesticide poisoning.
31.	Pesticide application methods – Spraying, dusting, granular application (Broadcasting, furrow application, side dressing, spot application, ring application, root zone application, leaf whorl application and pralinage) seed pelleting, seedling root dip, sett treatment, stem injection, root feeding, stem padding, *etc*.
32.	Pesticide appliances – Sprayers- high volume sprayers (Hand sprayer, knapsack sprayer and rocker sprayer) and low volume sprayers (Power sprayer / mist blower), dusters (Rotary dusters, knapsack dusters, power operated dusters plunger duster) and other appliances (Soil injector, pseudostem injector and bird scarer.
33.	Behavior modifying chemicals (Intra specific and inter specific

	semiochemicals) and use of pheromones in pest management (Monitoring, mass trapping and mating disturbance).
34.	Role of entomologists in identification (Identification of various stages of pest and types of damage symptoms) and management of field pest problems (practicing various management strategies in field level)

Practical syllabus

External features of grass hopper- mouth parts of grass hopper, bug and butterfly. Silkworm rearing – improved methods and appliances. Bee keeping, bee keeping appliances. Study of symptoms and types of damage caused by pests. Assessment of insect population, damage and crop losses in rice, cotton, groundnut, sugarcane and pulses. Practicing various pest control methods; cultural, physical and mechanical methods. Biological control – mass culturing of predators and parasitoids. Behavioral approaches- pheromone traps- light traps- fish meal traps- yellow sticky traps, different groups of pesticides, their formulations and label information, pesticide application methods and safe handling of pesticides.

Practical schedule

Ex. No.	Contents to be taught/ Dealt
1	Practicing the different methods of insect collection *viz*.,Insect net (Aerial net and sweep net),Aspirator andBerlese funnel;Killing - preparation of cyanide / ethyl acetate killing bottle, Pinching the thorax; Preservation -Paper folds (Paper envelopes),Relaxing container, setting , methods of pinning, mounting, labelling and display.
2	Observation and sketching of external features of grass hopper *viz*., Head (Simple eye, compound eye, antenna and mouth parts), thorax (Prothorax, mesothorax, metathorax) and abdomen (Spiracles, reproductive organs).
3.	Observation and sketching of mouth parts of grass hopper (Biting and chewing type - mandibles, maxillae, labrum, labium and hypopharynx), bug (Piercing and sucking type – labial beak, mandibular and maxillary stylets) and butter fly (Siphoning type - galeae of the maxillae).
4.	Moriculture - mulberry varieties, method of propagation. Practicing methods of silkworm rearing, rearing appliances, important pests and diseases of silkworm and their management.
5.	Apiculture - Observing different bee species (Rock bee, Indian bee, Italian bee, little bee and dammer bee), biostages of honey bees, castes, bee keeping appliances and pests and diseases of honey bees; practicing apiary management practices.
6	Study of symptoms and types of damage caused by pest - Representation by flow chart: Feeding- direct Aerial - mandibulate (external and internal)

	and haustellate, subterranean, stored products- primary feeder and secondary feeder, indirect (vector diseases and contamination), subterranean- mandibulate (internal and external).
7	Assessment of insect population / damage in rice (Thrips, green leaf hopper, brown plant hopper, earhead bug, rice stem borer and leaf folder) and cotton (leafhopper, whitefly, stem weevil and bollworms).
8	Assessment of insect population / damage in sugarcane (Early shoot borer and internode borer) and pulses (stem fly, *Spodoptera* and pod borers).
9	**Mid semester Practical Examination**
10	Practicing of various pest control methods including appliances - cultural methods, mechanical methods, physical methods and biological methods.
11	Mass culturing techniques of predators (Australian ladybird beetle and green lace wing bug) and parasitoids (*Trichogramma spp.*)
12	Practicing the behavioural methods- pheromone traps (Sticky trap, water pan trap and funnel type models available for pheromone based traps), light traps (Incandescent light trap, mercury vapour lamp light trap and black light trap), fishmeal and yellow sticky traps in field level.
13	Studying the formulations, label information and toxicity parameters of different insecticide groups. Quantification of insecticide requirement for field application (calculations).
14	Practicing of pesticide application methods - spraying (EC or WP), dusting, granular application (Broadcasting, furrow application, side dressing, spot application, ring application, root application, whorl application and pralinage), seed dressing, seedling root dip, sett treatment, trunk/ stem injection, padding, swabbing, root feeding, soil drenching, capsule placement, baiting and fumigation techniques (soil, storage and trunk).
15	Handling of pesticide appliances- Sprayers - high volume sprayers (Hand sprayer, knapsack sprayer and rocker sprayer) and low volume sprayers (Power sprayer / mist blower), dusters (Rotary dusters, knapsack dusters, and power operated dusters plunger duster) and other appliances (Soilinjector, pseudostem injector and bird scarer).
16	Preparation of plant bio pesticides (Neem oil 3 per cent and neem seed kernel extract 5 per cent) and practicing the safe handling of pesticides (Storage of pesticides, personal protective equipment, safety in application of pesticides, safety after application and first aid .
17.	**Final practical examination**

Course outcome

The students will be familiarized with morphology of the insect, economic importance, various IPM strategies, pesticide application methods, safe handling of pesticides and antidotes.

References/ Text books

Srinivasan. G, R. Pandiyan and P. Karthik.2018. General and economic entomology (Diploma standard). Institute of agriculture, kumulur, Trichy.163 p.

Dhaliwal G.S., and Ramesh Arora.2004. Integrated Pest management concepts and approaches, Kalyani publishers, Calcutta.427p.

PAT D11	Principles of Plant Pathology	(1+1)

Objective

To study the plant diseases caused by plant pathogens and know the principles of plant disease management

Theory Syllabus

Plant diseases – definition**,** Causes of plant diseases – Fungi, Bacteria, Viruses and Mycoplasma-Viriods (PSTV) – General characters ; Categories of plant diseases symptoms of bacterial ,viral diseases;Environmental factors influencing disease out breaks – role of weather factors –temperature, relative humidity, rainfall, dew and light ; Disease surveillance - Assessment of crop diseases and loss**-** survival and mode of spread of plant pathogens – Principles of management in Plant Disease Control - Exclusion – Eradication – Immunization – Protection – Cultural – Methods of Control – Bio control – Classification of fungicides - Characteristics of an ideal fungicide – Care in handling fungicides – Major groups – Formulation and Applications – Precautions in using fungicides – Methods of application of biofungicides - Useful fungi – mushroom, cultivation of oyster mushroom

Theory Schedule

Lecture No	Content to be taught
1.	General character of fungi, bacteria, virus and phytoplasma Fungi – Types of mycelia -Types of vegetative, asexual and sexual spores-asexual and sexual fruiting bodies Bacteria – size, shape and flagella Virus – morphology and structure of virus, movement and transmission (mechanical, seed and vector) Phytoplasma – structure and transmission
2.	Categories of plant diseases Types of infection, spread, occurrence (epidemic, endemic, sporadic and pandemic). Types of symptoms and part affected (root, tuber, stem, leaf, flower and fruit)
3.	Symptoms of fungal and bacterial diseases – blight, streak, wilt, canker, black arm and soft rot
4.	Symptoms of viral diseases – mosaic, chlorosis, leaf curl, spotted wilt, leaf crinkle, vein clearing, rosette and bunchy top
5.	Role of weather factor – Temperature, relative humidity, rain fall, dew and light
6.	Disease surveillance – survey (fixed plot and roving survey), assessment (percent disease incidence and percent disease index), forecasting (mass

	media - news paper and TV, forecasting models (Blast cast)
7.	Survival and mode of spread of plant pathogens Survival (resting structure, weed host, self sown crop, alternate host and ratton crops) mode of spread (active dispersal, passive dispersal, externally and internally seed borne)
8.	Exclusion – plant quarantine, crop inspection, seed certification, disease introduced from other countries to India, phytosanitory certificate
9.	**Mid semester examination**
10.	Eradication – Eradication from seeds and seed materials (Mechanical methods and physical methods (Luthra's solar treatment),
11.	Eradication – chemical methods and biological methods Chemical methods (wet, dry and slurry treatment), Biological methods includes, eradication of infected plants (sanitation and rouging), Eradication of alternate host, crop rotation, mixed cropping and cultural practices.
12.	Immunization – Resistance (horizontal and vertical resistance), resistance varieties, structural resistance (waxes and cuticle, cell wall) chemical resistance
13.	Protection – cultural methods (host eradication, crop rotation, mixed cropping and sanitation)
14.	Classification of fungicides – based on mode of action, general use, and chemical composition. Copper (a.Copper sulphate - Bordeaux mixture, Bordeaux paste, cheshnut compound. b.Copper carbonate - chaubattia paste, c. Cuprous oxide - copper oxychloride and copper hydroxide), Sulphur - Inorganic sulphur (a.Element sulphur – sulphur dust, wettable sulphur. b. Lime sulphur), Organic sulphur (dithiocarbamates – monoalkyl and dialkyl dithiocarbamates)
15.	Methods of application of fungicides – seed dressing (mechanical, chemical – dry & wet seed treatment, slurry treatment and special methods), physical methods – hot water treatment, hot air, aerated steam therapy, moist hot air treatment and solar treatment
16.	Methods of application of biofungicides – seed treatment, seedling root dip, soil application, foliar application and capsule application.
17.	Cultivation of oyster mushroom –mushroom cropping room, spawn production (mother and bed spawn), substrate preparation and nutritional values

Practical Syllabus

Identification of plant diseases – Fungi,bacterial and viral diseases infected plants in various crops and symptoms , causal organism and favorable conditions ; Assessment of crop loss - Survey and assessment of plant diseases: Fungicides – Groups of fungicides - Safety measures - preparation of fungicidal solutions - methods of application of fungicides- Fungicides for seed treatment – Foliar and Soil application –Methods of application of biocontrol agents and commercial formulations - *Trichoderma* spp. *Pseudomonas fluorescens*. - Cross protection techniques in plant disease management; mushroom - Cultivation methods for oyster mushroom

Practical Schedule

Ex. No	Content to be taught
1.	Identification of root rot and wilt infected plants in various crops and symptoms, causal organism and favorable conditions
2.	Identification of downy mildew and powdery mildew infected plants in various crops and symptoms, causal organism and favorable conditions
3.	Identification of rust and white rust infected plants in various crops and symptoms, causal organism and favorable conditions
4.	Identification of smut and sugary diseases infected plants in various crops and symptoms, causal organism and favorable conditions
5.	Identification of leaf spot, leaf blight and anthracnose infected plants in various crops and symptoms, causal organism and favorable conditions
6.	Identification of bacterial and viral diseases infected plants in various crops and symptoms, causal organism and favorable conditions
7.	Survey and assessment of plant diseases Methods of survey (fixed plot and roving survey), methods of assessment (Percent disease incidence and percent disease index)
8.	Study of various group of fungicides – mode of action, general use and chemical composition.
9.	**Mid semester practical examination**
10.	Safety measure to be followed during handling of fungicides
11.	Preparation of fungicides – Bordeaux mixture and Bordeaux paste
12.	Methods of application: spraying and dusting, seed treatment and soil drenching, corm injection and root feeding.
13.	Biological control of plant diseases – mass multiplication of *Trichodermaviride,* quality control and specification. Mass multiplication of *Pseudomonas fluorescens,*quality control and specification.

14.	Methods of application of biocontrol agents and commercial formulations – seed treatment, seedling root dip, soil application, foliar application and capsule application. Commercial formulations (talc and liquid)
15.	Cross protection techniques in plant disease management Symptoms of severe strain, mid strain, citrus tritize virus and preimmunization techniques. Management of crop diseases by new product and various formulations – neem products, neem seed kernel extract, neem oil solution, neem cake extract and antiviral principle.
16.	Oyster mushroom cultivation – preparation of mushroom shed, spawn preparation, substrate preparation, preparation of mushroom bed, management of pest and diseases, harvest and yield
17.	**Final practical examination**

Course Outcome

The students will be familiarized about the importance of plant diseases, disease causing microorganisms, mode of spread and principles of plant disease management.

References

1. V.Prakasam,V., T.Raguchander.,K.Prabakar., V.K.Parthiban. 2006. Applied Plant Pathology. Pp: 254.

2. V.Prakasam,V.,T.Raguchander.,K.Prabakar.1998. Plant disease management.pp:128

3. R.S.Singh.2018. Introduction to principles of plant pathology. Fourth Edition.

SAC D12	Soil Nutrient Management	(1+1)

Objective

To impart knowledge about soil fertility and nutrient availability, to understand the role of fertilizers and manures in supplying nutrients to plants so as to achieve high fertilizer use efficiency.

Theory Syllabus

Plant nutrients - Primary, secondary and micronutrients - Definitions of soil fertility and soil productivity - Functions, deficiency, toxicity symptoms of plant nutrients and correction measures - Manures and fertilizers - Nitrogenous, Phosphatic and Potassic fertilizers - Secondary and micronutrient fertilizers - Mixed fertilizers and water soluble fertilizers - fixation and losses of nutrients from soil - Nutrient use efficiency - methods of fertilizer application - INM - Soil fertility evaluation - Soil testing and fertilizer recommendations.

Theory Schedule

Lecture No.	Contents to be taught
1.	Plant nutrients - Criteria of Essentiality – Classification - Primary, secondary and micronutrients - Forms of nutrients absorbed by plants - law of minimum, law of diminishing return - deficient, critical range, sufficient, luxury consumption - Soil Fertility, Soil productivity – Definitions.
2.	Functions, deficiency symptoms and correction measures of primary nutrients in plants.
3.	Functions, deficiency, toxicity symptoms and correction measures of Secondary nutrients and micronutrients in plants.
4.	Manures - Classification - Bulky organic manures- Concentrated organic manures – Nutrient composition and significance of organic manures.
5.	Fertilizers - Classification - based on physical form (solid and liquid fertilizers), based on nutrient form (Nitrogenous, phosphotic, potassic fertilizers), based on the nutrient content (straight, complex, mixed fertilizers)
6.	Nitrogenous fertilizers - ammonium, nitrate, ammonium plus nitrate, amide forms, slow release N, solution N forms - their nutrient content Phosphatic fertilizers - citric acid insoluble, citric acid soluble, water soluble fertilizers- rock phosphate, bone meal, basic slag, SSP, DAP, MAP - their nutrient content Potassic fertilizers - MOP, SOP- their nutrient content
7.	Secondary nutrients and Micronutrient fertilizers - their nutrient content

8.	Mixed fertilizers and water soluble fertilizers - Ingredients - points to be noted for preparing fertilizer mixture - advantages and disadvantages of fertilizer mixtures.
9.	**Mid-Semester Examination**
10.	Fixation and losses of nutrients from soil Nitrogen - leaching, denitrification, ammonia volatilization, ammonium fixation, crop removal, soil erosion; Phosphorus - fixation - factors affecting P fixation in soil; Potassium - fixation and leaching; Micronutrients - fixation
11.	Method of fertilizer application - Broadcasting, Placement, Nutriseed Pack, Foliar application, fertigation - fertilizer solubility
12.	Techniques to enhance use efficiency of fertilizers – 4 R principles in nutrient management - Right source, Right method, Right quantity, Right time. Techniques to enhance Nitrogen Use Efficiency - reducing solubility, reducing rate of hydrolysis, reducing rate of nitrification, split application, slow release products, LCC based fertilizer recommendation
13.	Techniques to enhance Phosphorus use efficiency - Enriched FYM, method of application, liming of acid soils, P solubilising and mobilizing microbes. Techniques to enhance Potassium use efficiency - time of application, K solubilizer Techniques to enhance Micronutrients use efficiency – Enriched organic manures, chelated fertilizers
14.	Integrated nutrient management (INM) - objectives, major components, advantages, limitations
15.	Soil fertility evaluation - Based on soil test, Tissue analysis, Biological tests.
16.	Soil Testing programme - Nutrient rating followed in Tamil Nadu – Functions of soil testing laboratory and mobile soil testing laboratory
17.	Concept of STCR – IPNS, Targeted Yield approach - Software based fertilizer recommendation - DSSIFER, VDK

Practical Syllabus

Identification and application methods of manures and fertilizers. Identification of nutrient deficiencies symptoms in crops - Working out fertilizer requirement for straight and complex fertilizers, INM, organic agriculture - fertilizer recommendation based on STCR equation - Demonstration of DSSIFER and VDK softwares - Preparation of nutrients formulations for foliar spray - Preparation of enriched FYM and MN mixtures - Preparation of slow release fertilizers - Visit to compost unit / fertilizer mixing unit.

Practical Schedule

Ex.No.	Content to be taught
1.	Collection and identification of manures and fertilizers
2.	Identification of nutrient deficiencies symptoms in crops
3.	Working out fertilizer requirement for crops using straight fertilizers
4.	Working out fertilizer requirement for crops using complex fertilizers
5.	Working out fertilizer requirement for INM and organic agriculture
6.	Working out fertilizer requirement using STCR equation
7.	Demonstration of DSSIFER and VDK softwares
8.	Field visit and calculation of nitrogen recommendation by leaf color chart (LCC)
9.	**Mid-Semester Practical Examination**
10.	Preparation of nutrient formulations for foliar spray
11.	Preparation of enriched FYM
12.	Preparation of mixed fertilizers and customised fertilizers
13.	Preparation of Micronutrient mixtures
14.	Preparation of Micronutrient enriched organic manures
15.	Preparation of slow release fertilizers - Neem coated Urea
16.	Visit to compost unit / Fertilizer mixing unit
17.	**Final practical examination**

Course Outcome

Imparting knowledge on the essentiality of nutrients, soil fertility management, fertilizer recommendation and nutrient use efficiency.

References

1. John Havlin, James Beaten, Samuel Tisdale, Werner Nelson, 2005. *Soil Fertility and Fertilizers - An introduction to nutrient management*. 7th Edition, Prentice Hall. Upper Saddle River, NJ.

2. Singh. S.S.1996. *Soil Fertility and Nutrient Management*. Kalyani Publishers. New Delhi

ENS D11	Energy and Environment	(1+1)

Objective

To familiarize the students on different energy sources, conversion techniques and environmental concerns to achieve sustainability

Theory Syllabus

Energy

Energy Resources and Forms of Energy – Renewable and Non-renewable energy sources. Solar Energy –Merits and Limitations– Solar thermal energy utilization, Solar constant, Solar photovoltaic system – street light, lantern and water pumping. Wind Energy – Principle – Merits and Limitations of Wind Energy Conversion - Classification of WEC Systems. Energy from Biomass – Conversion technologies. Classification and types of Bio-Gas Plants- Selection of Site. Factors affecting biogas production and Utilization of Bio-gas, Biomass gasification – gasifiers – smokeless chula.

Environmental Science

Introduction to Environment (Segments of the Environment), Environmental Science and Ecosystems. Ecosystems – Structure (Biotic components and Abiotic components, productivity) and Function. Environmental pollution- Water, Air, Soil and Noise pollution: Sources, impact and management measures. Solid waste management: Sources, Impact and Management options-Composting and vermicomposting techniques-Maturity indices of composting- Ecological Perspective in Agriculture: Traditional Farming Systems, Eco friendly technologies in agriculture - Environmental Protection: Environmental Acts and standards.

Theory Schedule

Lecture No.	Content to be taught
1.	Energy Resources and Forms of Energy – Renewable and Non-renewable energy sources
2.	Solar Energy –Merits and Limitations– Solar thermal energy utilization
3.	Solar photovoltaic system – street light, lantern and water pumping
4.	Wind Energy – Principle – Merits and Limitations of Wind Energy Conversion - Classification of WEC Systems.
5.	Energy from Biomass – Conversion technologies
6.	Classification and types of Bio-Gas Plants- Selection of Site
7.	Factors affecting biogas production and Utilization of Bio-gas.

8.	Biomass gasification – gasifiers – smokeless chula
9.	**Mid Semester Examination**
10.	Introduction to Environment (Segments of the Environment), Environmental Science and Ecosystems.
11.	Ecosystems – Structure (Biotic components and Abiotic components, productivity) and Function.
12.	Water Pollution: Sources, Impact and Management measures.
13.	Air Pollution: Sources, Impacts (Smog, Acid Rain, Ozone Hole, Global Warming and Climate Change) and Management measures.
14.	Soil and Noise pollution: Sources, Impact and Management measures.
15.	Solid Waste Management: Sources, Impact and Management options – Solid Waste Management Hierarchy, Composting and Vermicomposting.
16.	Ecological Perspective in Agriculture: Traditional farming methods, Eco friendly technologies in agriculture
17.	Environmental Protection: Environmental Acts and standards

Practical Syllabus

Energy

Evaluation of solar cooker, solar water heater and solar dryer - Solar water pumping system.Water pumping wind mills. Bio-gas plants – KVIC &Deena Bhandu Models - Production of biogas and value added products. Performance & Evaluation of Biomass gasifier and improved chulas.

Environmental Science

Environmental Sampling and preservation techniques - Waste water characterization: pH, EC and TDS- Effect of waste water on crops: Germination test - Waste water treatment –Physical, chemical and Biological methods (Visit to Wastewater Treatment Plant) - Air pollution: Assessment of Suspended Particulate Matter (SPM) - Farm waste management Composting (windrow, heap and pit method)-Vermicomposting of farm and kitchen wastes.

Practical schedule

Ex.No	Content to be taught
1.	Evaluation of solar cooker
2.	Evaluation of solar dryer
3.	Study on solar water pumping system
4.	Study on water pumping wind mills
5.	Bio-gas plants – KVIC Model

6.	Bio gas plants –Deena Bhandu Model
7.	Study on biomass gasifiers
8.	Performance & Evaluation of improved chulas
9.	**Mid Semester Practical Examination**
10.	Environmental Sampling and Preservation techniques
11.	Characterization of Waste water: Physical, Chemical and Biological parameters – Testing of pH, EC, TDS.
12.	Effect of waste water on crops: Germination test
13.	Waste water treatment –Physical, chemical and Biological methods (Visit to Wastewater Treatment Plant)
14.	Air pollution: Assessment of Suspended Particulate Matter (SPM)
15.	Composting (windrow, heap and pit method) and Vermicomposting of farm wastes
16.	Vermicomposting of Kitchen wastes
17.	**Final Practical Examination**

Out come

This course will create awareness on the environment and develops attitude to utilize the energy resources effectively.

References

ErachBharucha, 2005. Textbook of Environmental Studies for Undergraduate Courses. UniversityPress, New Delhi.

Rai, G.D,2004. Non Conventional Energy Sources, Khanna Publishers, New Delhi.

TAMIL NADU AGRICULTURAL UNIVERSITY

DIPLOMA IN AGRICULTURE

III SEMESTER

S.No	Course No.	Course Title	Credit hours
1	AGR D21	Agronomy of Field Crops II	1+1
2	AGR D22	Crop Production- I	0+2
3	AGB D21	Methods of Plant Breeding	1+1
4	AEN D21	Crop Pests and Their Management	1+2
5	PAT D21	Crop Diseases and Their Management	1+2
6	CAG D21	Commercial Agriculture I	0+2
7	AEC D21	Agricultural Economics, Finance and Marketing	1+1
		Total	**5+11=16**

AGR D21	Agronomy of Field Crops – II	(1+1)

Objectives

To learn the package of practices of oilseeds, commercial crops, Narcotics, forages, green manure including Groundnut, Sesame, Castor, Sunflower, Commercial Crops – Cotton, Sugarcane, Sugarbeet and Jatropha -Narcotics - tobacco, Forages – fodder sorghum, fodder maize, fodder cumbu, cumbu napier grass, guinea grass, buffel grass, fodder cowpea, berseem, desmanthus, stylosanthus, lucerne - green manure & green leaf manure crops - Oilseeds and commercial crops based cropping system

Theory Syllabus

Agronomic Practices including Climatic and Soil Requirement, Land Preparation – Seeds and Sowing – Varieties – Irrigation and Fertilizer Management – Weed Control – intercultural operations- Harvesting – Cropping Systems for Oilseeds, Commercial Crops, Forages and Green Manure Crops.

Theory Schedule

Lecture No.	Content to be dealt
1.	Agronomic practices for groundnut - climatic - soil - land preparation – seeds and sowing- varieties - irrigation - fertilizer management - weed management -intercultural operations- harvesting.
2.	Agronomic practices for sesamum - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management -intercultural operations- harvesting.
3.	Agronomic practices for castor - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management -intercultural operations- harvesting.
4.	Agronomic practices for sunflower - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management -intercultural operations- harvesting.
5.	Agronomic practices for cotton - climatic - soil - land preparation - seeds and sowing - varieties - irrigation - fertilizer management - weed management.
6.	Agronomic practices for cotton - intercultural operations - harvesting - rice fallow cotton – rainfed cotton.
7.	Agronomic practices for sugarcane - climatic - soil - land preparation - varieties - sett preparation - planting methods - irrigation - fertilizer management
8.	Agronomic Practices for sugarcane - weed management - intercultural

	operations - harvesting - ratoon management.
9.	**Mid Semester Examination**
10.	Agronomic practices for tobacco - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management -intercultural operations- harvesting.
11.	Tobacco curing methods - flue curing, air curing, fire curing, sun cruing, pit curing.
12.	Agronomic practices for sugarbeet and jatropha - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management - intercultural operations - harvesting.
13.	Cropping system involving oil seeds and commercial crops - sequential cropping - intercropping.
14.	Forage crops - agronomic practices for fodder sorghum, fodder maize - fodder cumbu - cumbu napier grass - guinea grass - buffel grass - climatic - soil - land preparation - seeds and sowing - varieties - irrigation - fertilizer management - weed management - intercultural operations - harvesting - anti-nutritional factors in forages.
15.	Importance of legume forages - agronomic practices for fodder cowpea, berseem - desmanthus – stylosanthus - lucerne - climatic - soil - land preparation – seeds and sowing- varieties - irrigation - fertilizer management - weed management - intercultural operations - harvesting - tree fodder.
16.	Fodder preservation methods - Silage and hay making
17.	Agronomic practices for green manure crops - green manuring - green leaf manuring - green manure & green leaf manure crops.

Practical Syllabus

Various Methods of Nursery preparation – Varieties for different seasons – Utilization of Bio-fertilizers in oil seed and commercial crops.Seed Treatment for different crops - Oilseeds, Commercial Crops and Green Manure Crops.Practicing Field Preparation and Sowing of Oilseeds and Commercial Crops. – Delinting of Cotton –Sett Treatment and Planting Technique of Sugarcane – Silage Making in Fodder crops and their Preservation – Studying Cost of Cultivation for important crops.

Practical Schedule

Ex.No	Content to be dealt
1.	Establishing crop cafeteria involving major crops – oilseeds, commercial crops, forages and green manures.
2.	Identification of crops and varieties of oilseeds, sugar, fibre, Green manures and green leaf manures and forages.
3.	Working out seed requirement for direct sown crops.
4.	Practicing nursery preparation for irrigated upland.
5.	Practicing main field preparation for irrigated upland crops.

6.	Practicing different sowing methods for irrigated uplands.
7.	Practicing biofertilizer and Calcium chloride seed treatment for groundnut.
8.	Practicing sett preparation in sugarcane.
9.	**Mid Semester practical Examination**
10.	Practicing sett treatment and planting in sugarcane.
11.	Estimation of plant population per unit area for important crops.
12.	Practicing delinting in cotton.
13.	Practicing seed hardening for rainfed crops.
14.	Observation on growth parameters of oil seeds, fibres, sugars and commercial crops.
15.	Observation on yield parameters, assessing maturity and estimation of yield of oil seeds, fibres, sugars and commercial crops.
16.	Working out cost of cultivation and economics of important crops – Groundnut, sesame, cotton and sugarcane.
17.	**Final Practical Examination**

Course Outcome

Learning agronomic practices and acquiring skill by practicing the techniques.

References / Text Books

Crop production guide. 2012. Tamil Nadu Agricultural University and Department of Agriculture, Government of Tamil Nadu.

http://agritech.tnau.ac.in– TNAU Agritech portal.

Sankaran, S. and V.T. SubbiahMudaliar. 1997. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

AGR D22	Crop Production-I	(0+2)

Objectives

To learn and acquiring skill on the package of practices of low land rice/ irrigated upland crop.

Practical schedule

The students will learn crop cultivation by doing themselves. Each student will be allotted with a piece of land and do all field operations from field preparation to harvest in the allotted field. Each student will record the observation like germination percentage, plant population, plant height at different stages of the crops, days to 50% flowering, number of grains per panicle, test weight of grains, recording the plot yield and working out the cost of cultivation. The student will maintain cultivation sheet and record of work done with biometric observations and comments on various operations performed and factors of production. The student will raise one crop. It may be either lowland rice or irrigated upland crop according to their season and resource availability. There should not be repetition of crop in both AGR A22 Crop production – I (0+2) and AGR A24 Crop production -II (0+2). However, rice is the compulsory crop to be raised in either AGR A22 Crop production – I (0+2) or AGR A24 Crop production II (0+2).

Course Outcome

Learning agronomic practices and acquiring skill by practicing the techniques.

References / Text Books

Crop production guide. 2012. Tamil Nadu Agricultural University and Department of Agriculture, Government of Tamil Nadu.

AGB D21	Methods of Plant Breeding	(1+1)

Objective: To know the basic information on plant breeding methods

Theory Syllabus

Objectives and role of plant breeding - historical perspective–activities in Plant Breeding. Reproduction and pollination system in plants- Mechanisms promoting self and cross pollination in crop plants. Photosynthesis, respiration and translocation of assimilates. Self-incompatibility – Applications and limitations. male sterility– classification – CMS,GMS,CGMS,EGMS, Gametocides applications. Germplasm conservation, utilization and Wide hybridization. Breeding techniques for self-pollinated crops –Mass Selection- Pure line Selection, Bulk method, Modified Bulk Breeding, SSD and Backcross. development of Inbreds, Heterosis, - Development of hybrids, Composite & Synthetic variety- Development of varieties, hybrids and maintenance of records. Clonal selection- apomixes and their utilization in plant breeding. Mutation and Ploidy Breeding

Theory Schedule

Lecture No.	Contents to be taught
1	Definition, objectives and role of plant breeding - historical perspective, Scientists worked in Plant breeding, activities in Plant Breeding.-achievements in Plant Breeding
2	Modes of reproduction – asexual (Natural and artificial vegetative propagation)- Sexual- self and cross pollination, Significance of pollination, General morphology of flower – Calyx, Corolla, Androecium and Gynoecium
3	Mechanisms promoting self and cross pollination in crop plants Self-pollination- Bisexuality, Homogamy, cleistogamy, chasmogamy, position of anthers Cross pollination- Allogamy, Dicliny, Dichogamy, heterostyly, Herkogamy, Self incomatability and male sterility
4	Photosynthesis- Definition, Significance, Respiration- Definition, Significance
5	Self-incompatibility –Definition, classification, measures to overcome and utilization in plant breeding and limitations,
6	Male sterility – Definition, I, Types – CMS,GMS,CGMS,EGMS, - Utilization and limitations -Gametocides – applications
7	Germplasm conservation,- Types of germplasm, insitu and exsitu conservation- Gene sanctuaries and gene banks- uses

8	Breeding methods for self pollinated crops-Plant Introduction, Mass selection and Pure line selection, Main features, procedure, Merits and demerits
9	**Mid semester examination**
10	Pedigree and Backcross method of breeding- Main features, procedure, Merits and demerits
11	Bulk method and Modified Bulk Breeding - Main features, procedure, Merits and demerits and Single Seed Decent (SSD) breeding method- Main features, procedure, Merits and demerits
12	Breeding methods for cross pollinated crops- Introduction, Mass selection, Heterosis breeding - Definition, types of Heterosis,Procedure Merits and demerits
13	Hybrid varieties, Types of hybrid, development of hybrid varieties, Development and maintenance of Inbred and its significance
14	Synthetic and Composites and its significance- Steps in development- Merits and demerits
15	Mutation breeding-Definition, Types of mutation- Spontaneous and induced, types of mutagen (Physical and chemeical) and Ploidy Breeding –Definitions of Auto and allopolyploidy with examplesspeed breeding methods
16	Breeding methods for vegetatively propagated crops- Clonal Selection- Definition- procedure, merits and demerits
17	Innovative Breeding methods –Plant Tissue Culture- molecular breeding, biofortification of crops - Defintion, merits and demerits

Practical syllabus

Agricultural Classification of crops, economic importance and economic parts- Breeder's kits, components and its uses. Emasculation, Selfing and crossing techniques- Maintenance and utilization of A, B and R lines for hybrid seed production- Development of Single cross, Double cross, Three way Cross and Top cross. Pure line Development and Pedigree Method. mutation breeding- clonal selection- Types of different yield trials, Data collection and recording of different biometric traits in important field crops. Classes of seeds and its maintenance- Steps involved in the release of varieties and maintenance of records.

Practical schedule

Ex No.	Contents to be taught
1.	Agricultural Classification of crops, economic importance and Identification of economic parts

2.	General morphology of flower – Calyx, Corolla, Androecium and Gynoecium ; Breeder's kit and its components – Uses, draw the diagram of various Breeder kits
3.	Emasculation, Selfing and crossing Techniques, Tagging, Bagging and Harvesting and storage
4.	Maintenance and utilization of A, B and R lines for hybrid seed production-Rice, Maize, Cotton and sunflower
5.	Development of Single cross, Double cross, Three way Cross and Top cross and its performance prediction
6.	Classes of seeds and its maintenance- Nucleus Seed, Breeder Seed, Foundation Seed, Certified Seed and Truthful Labelled Seed
7.	Mutation breeding- Chemical mutations of seeds by EMS
8.	Types of different yield trials, Layout of different yield trials
9	**Mid semester practical examination**
10	Data collection and recording of different biometric traits in important field crops
11	Germplasm exploration, collection, characterisation and documentation
12	Steps involved in the release of varieties
13	Maintenance of records in varietal and hybrid development
14.	Visit to Breeder seed production plots
15.	Visit to private seed company
16.	Visit to Plant tissue culture unit - learning practical aspects of commercial micro propagation
17.	**Final Practical Examination**

Course Outcome

Students will be familiarized with all the plant breeding techniques and methods

References

Singh, B.D. 2015. Plant breeding - Principles and methods. Kalyani Publishers, New Delhi.

Phundhan Singh. 2015. Essentials of plant breeding(5th edition), Kalyani publishers, New Delhi.

Chopra, V. L., 1994. Plant breeding theory and practice. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi

Sharma, J.R. 1994. Principles and practice of Plant Breeding. Tata McGraw - Hill Publishing Co. Ltd., New Delhi

Web resources

- http://agritech.tnau.ac.in
- http://www.agriinfo.in
- http://www.edugreen.teri.res.in/explore/bio/breed.htm
- http://www.iaea.org/
- www.nbpgr.nic.in

AEN D21	Crop Pests and Their Management	(1+2)

Objective

To understand the array of all crop pests, their damage, symptoms and their management

Theory syllabus

Damage symptoms, life cycle and management practices of insect and non insect pests of Rice, Sorghum, Maize, Cumbu, Ragi, Cotton, Sugarcane, Pulses, Groundnut, Castor, Gingelly, Sunflower, Brinjal, Tomato, Bhendi, Cucurbits, Crucifers, Moringa, Tapioca, Chillies, Onion, Coconut, Turmeric, Coffee, Tea, Flower Crops, Mango, Citrus, Banana, Grapes, Sapota, Pomegranate, Pests of stored materials and their management. Rodents and other non- insect pests and their management.

Theory schedule

Lecture No.	Contents to be taught/ Dealt
1	Pests of Rice- Scientific Name, Binomics, damage symptoms and management of rice stem borer, gall midge, leaf folder, brown plant hopper, green leaf hopper, thrips, earhead bug, mealybug and cutworm.
2	Pests of sorghum, Maize, cumbu, ragi- Scientific Name, Binomics, damage symptoms and management of shoot fly, stem borers, earhead bug, fall armyworm, gall midge, earhead caterpillar/ cob borer, aphids and ashweevil.
3	Pests of red gram, green gram and black gram- Scientific Name, Binomics, damage symptoms and management of stem fly, aphid, white fly, pod borers (gram pod borer, spotted pod borer, blue butter fly, plume moth, pod fly, pod wasp), blister beetle, pod bugs and pulse beetle.
4	Pests of groundnut, castor, gingelly and sunflower- Scientific Name, Binomics, damage symptoms and management of red hairy caterpillar, groundnut leaf miner, termite, groundnut pod borer, tobacco caterpillar, castor capsule borer, hairy caterpillars, semiloopers, gingelly leaf webber cum capsule borer, sphingid, gingelly leaf hopper and sunflower head borer.
5	Pests of Cotton- Scientific Name, Binomics, damage symptoms and management of leaf hopper, aphid, whitefly, mealy bug, stem weevil, bollworms, red cotton bug and dusky cotton bug.
6	Pests of sugarcane- Scientific Name, Binomics, damage symptoms and management of borers, root grub, termites, scales, pyrilla and woolly aphid.
7	Pests of brinjal, tomato and bhendi- Scientific Name, Binomics, damage symptoms and management of Hadda beetle, ashweevil, brinjal shoot and fruit borer, brinjal leaf hopper, tomato fruit borer, tomato pin worm, serpentine leaf miner, tobacco caterpillar, bhendi fruit borers, whitefly and mites.

8	Pests of cucurbits and crucifers - Scientific Name, Binomics, damage symptoms and management of pumpkin caterpillar, pumpkin beetle, fruit flies and flea beetle, diamond back moth, leaf webber, cabbage borer, cabbage butterfly and semilooper.
9	**Mid semester Examination**
10	Pests of moringa, tapioca, chillies and onion - Scientific Name, Binomics, damage symptoms and management of moringa budworm, leaf worm, moringa hairy caterpillar, moringa fruit fly, tapioca scale, whitefly, chillies fruit borer, thrips, mite, onion fly and onion thrips.
11	Pests of mango and citrus - Scientific Name, Binomics, damage symptoms and management of mango hoppers, stemborer, mango mealy bug, mango nut weevil, mango shoot and leaf webber, orange borers, red ant, citrus fruit sucking moth, lemon butterfly, leaf miner and citrus psyllid .
12	Pests of banana and guava - Scientific Name, Binomics, damage symptoms and management of banana rhizome weevil, pseudostem weevil, aphid, tingid bug, guava fruit borer, fruit fly, tea mosquito bug and mealybug.
13	Pests of sapota, grapes and pomegranate - Scientific Name, Binomics, damage symptoms and management of sapota leaf webber, bud worm, grapevine stem gridler, flea beetle, mealy bug, thrips, fruit sucking moth, pomegranate fruits borers and mealy bug .
14	Pests of coconut and turmeric - Scientific Name, Binomics, damage symptoms and management of red palm weevil, rhinoceros beetle, black headed caterpillar, eriophyid mite, rugose spiraling white fly, turmeric shoot borer, leaf folder and rhizome scale.
15	Pests of coffee and tea - Scientific Name, Binomics, damage symptoms and management of white stem borer, red borer, berry borer, shot hole borer, scale, mealy bug, tea looper, tea mites and tea mosquito bug.
16	Pests of rose and jasmine- Scientific Name, Binomics, damage symptoms and management of jasmine bud worm, leaf webber eriophyid mite, rose leaf cutter bee, red spider mite, thrips and aphids.
17	Pests of stored pests - Scientific Name, damage symptoms and management of rice weevil, pulse beetle, red flour beetle, rice moth, Angoumois grain moth, cigarette beetle, sweet potato weevil, potato tuber moth.

Practical syllabus

Identification of the damage symptoms, life stages of important pests in different field crops, horticultural crops and storage products and Collection and preservation. IPM package practices of Rice, Cotton, Sugarcane, Groundnut and pulses.

Practical schedule

Ex.No	Contents to be taught/ Dealt
1.	Field identification of damage symptoms, various biostages of borers and defoliators of rice *viz*. stem borer, gall midge, leaf folder, cutworm, whorl maggot, *etc*.
2.	Field identification of damage symptoms, various biostages of sucking pests of rice *viz*., brown plant hopper, green leaf hopper, thrips, earhead bug, black bug and mealybug *etc*.
3.	Field identification of damage symptoms, various biostages of sorghum, Maize, cumbu, ragi pests *viz*., shoot fly, stem borers, earhead bug, fall army worm, gall midges, earhead / cob borer, aphids, grass hopper, ashweevil, *etc*.
4.	Field identification of damage symptoms, various biostages of red gram borers and sucking pests *viz.,* stem fly, pod borers (gram pod borer, spotted pod borer, blue butterfly, plume moth, pod fly and pod wasp) blister beetle, pod bugs, mite, *etc*.
5.	Field identification of damage symptoms, various biostages of pests of green gram and black gram *viz.*, stem fly, flea beetle, aphids, whitefly and pod borers (gram pod borer, spotted pod borer and blue butterfly), blister beetle, pod bugs, pulse beetle, *etc.*
6.	Field identification of damage symptoms, various biostages of pests of groundnut and sunflower *viz*., red hairy caterpillar, leaf miner, aphid, thrips, tobacco caterpillar, leaf hopper, earwig, termite, sunflower head borer, leaf hopper, *etc*.
7.	Field identification of damage symptoms, various biostages of pests of gingelly and castor *viz*., gingelly leaf webber cum capsule borer, gingelly leaf hopper, sphingid, castor capsule borer, hairy caterpillars, semiloopers, whitefly, castor slug, leaf miner, *etc,*
8.	Field identification of damage symptoms, various biostages of cotton sucking pests *viz*., leaf hopper, aphid, thrips, whitefly, mealy bug, red cotton bug, dusky cotton bug, mite, *etc.*
9.	Field identification of damage symptoms, various biostages of cotton bollworms and defoliators *viz*., American bollworm, spiny bollworm, spotted bollworm, pink bollworm, stem weevil, semiloopers, leaf roller *etc.*
10.	Field identification of damage symptoms, various biostages of sugarcane borers *viz*., early shoot borer, internode borer, top borer, root borer, *etc*.
11.	Field identification of damage symptoms, various biostages of sugarcane sucking pests and subterranean pests *viz*., root grub, termites, scales, leaf hopper, woolly aphid, whitefly, mealy bug, *etc*.
12.	Identification of important rodents and their damage symptoms in various agricultural and horticultural crops.
13.	Study of non insect pests *viz.,* mites, nematodes, snails, slugs, birds and its damage symptoms and their management in various crops.
14.	Field identification of damage symptoms, various biostages of pests of brinjal *viz*., Hadda beetle, ashweevil, shoot and fruit borer, leaf hopper, lace wing bug, red spider mite and whitefly, *etc*.
15.	Field identification of damage symptoms, various biostages of pests of tomato *viz*., fruit borer, tobacco cut worm, pinworm, serpentine leaf miner,

	whitefly, *etc.*
16.	Field identification of damage symptoms, various biostages of pests of bhendi and chillies *viz*., shoot and fruit borer, leaf hopper, red spider mite, whitefly, aphids, chilli fruit borer, chilli thrips, chilli mite and leaf eating caterpillar, *etc*.
17.	**Mid semester Practical Examination**
18.	Field identification of damage symptoms, various biostages of pests of cucurbits and crucifers *viz*., diamond back moth, leaf webber, cabbage borer, cabbage butterfly, semilooper, pumpkin caterpillar, pumpkin beetle, fruit flies, flea beetle, *etc*.
19.	Field identification of damage symptoms, various biostages of moringa, tapioca, turmeric and onion pests *viz*., budworm, leaf webber, ash weevil, fruit fly, hairy caterpillar, tapioca scale, whitefly, mealybug, turmeric leaf roller, rhizome scale, shoot borer, onion fly, onion thrips, *etc*.
20.	Field identification of damage symptoms, various biostages of pests of mango *viz*., hoppers, stem borer, mealy bug, nut weevil, shoot and leaf webber, red ant, *etc*.
21.	Field identification of damage symptoms, various biostages of pests of citrus, banana and grapes *viz*., citrus fruit sucking moth, orange borer, lemon butterfly, citrus leaf miner, citrus psyllid, banana aphid, rhizome weevil, pseudostem weevil, tingid bug, thrips, skipper, grapevine stem gridler, flea beetle, grapes mealy bug, thrips and fruit sucking moth.
22.	Field identification of damage symptoms, various biostages of pests of sapota, guava and pomegranate *viz*., sapota leaf webber, bud worm, guava fruit borer, tea mosquito bug, rugose spiralling white fly, fruit fly, mealybug, pomegranate fruits borers, aphids, thrips, mealy bug, *etc*.
23.	Field identification of damage symptoms, various biostages of pests of coconut *viz*., red palm weevil, rhinoceros beetle, black headed caterpillar, slug caterpillar, scales, eriophyid mite, rugose spiralling white fly, termite, *etc.*
24.	Field identification of damage symptoms, various biostages of pests of coffee and tea *viz*., white stem borer, red borer, berry borer, shot hole borer, scale, mealy bug, tea looper, mites, tea mosquito bug,*etc.*
25.	Field identification of damage symptoms, various biostages of pests of jasmine and rose *viz*., jasmine bud worm, leaf webber, eriophyid mite, rose leaf cutter bee, thrips, red spider mite, aphids, *etc.*
26.	Field identification of damage symptoms, various biostages of storage pests of agricultural and horticultural crops under storage godown *viz*., rice weevil, pulse beetle, red flour beetle, rice moth, angoumois grain moth, saw toothed beetle, khapra beetle, cigarette beetle, drug store beetle, sweet potato weevil, potato tuber moth, almond moth, Indian meal moth and tamarind beetle.
27.	Visit to FCI and CWC godowns to study different scientific methods of storage.
28.	Exercising Integrated pest management package of practices in Rice
29.	Exercising Integrated pest management package of practices in Cotton
30.	Exercising Integrated pest management package of practices in Sugarcane
31.	Exercising Integrated pest management package practices in Groundnut
32.	Exercising Integrated pest management package practices in pulses

33.	Field visit and collection of crop pests.
34.	**Final practical examination**

Course outcome

The students will be familiarized with all crop pests, their damage, symptoms, biostages and their management by Integrated Pest Management (IPM) practices.

References/ Text books

Regupathy.A and R. Ayyasamy.2016. A guide on crop pests. Namrutha Publicaitons, Chennai.389 p.

Kalaiyarasan. S and M.Kalyanasundaram.2003. Pest management in horticultural crops. Keren Desk Top Publishers, Vellore .282p.

PAT D21	Crop Diseases and Their Management	(1+2)

Objective

To understand the array of all crop diseases, causal organism symptoms, favourable conditions and their management

Theory Syllabus

Major diseases caused by Fungi, Bacteria, Virus and Mycoplasma in Cereals (Rice, Sorghum, Maize, Cumbu, Ragi), Pulses (Red gram, Black gram, Green gram, Bengal gram, Cowpea, Lablab) – Oil seeds (Groundnut, Gingelly, Sunflower, Castor), Cash crops (Cotton, Sugarcane, Tobacco, Betelvine) – Fruits (Mango, Banana, Grapevine, Sapota, Pomegranate, Papaya), Guava – Vegetables (Tomato, Chilllies, Brinjal, Bhendi, Cucurbits, Crucifers, Onion, Garlic) – Plantation crops (Coffee, Tea, Rubber, Coconut, Arecanut) – Spices (Turmeric, Pepper, Cardamom, Coriander, Ginger) – Flowers (Rose, Jasmine, Crossandra, Chrysanthemum, Tuberose) and their management

Theory schedule

Lecture No.	Contents to be taught/ Dealt
1	Causal organism, symptoms, favourable conditions and management of diseases of Rice : Blast, brown spot, sheath blight, sheath rot, grain discolouration, false smut, Bacterial leaf blight and Rice tungro virus Sorghum : downy mildew, leaf blight, smut diseases, grain smut, loose smut, long smut, head smut, sugary disease, rust and charcoal rot
2	Causal organism, symptoms, favourable conditions and management of diseases of Maize : Downy mildew, leaf blight, rust, charcoal rot and post flowering stalk rot Cumbu : Downy mildew, leaf spot, ergot or sugary disease, rust and smut Ragi - Blast, leaf blight, smut, downy mildew and mottle streak virus
3	Causal organism, symptoms, favourable conditions and management of diseases of Red gram : Fusarium wilt, dry root rot, powdery mildew, stem blight, leaf spot and sterility mosaic virus/sterility mosaic disease (SMD) Black gram and green gram : root rot, wilt, anthracnose, rust, powdery mildew, yellow mosaic and leaf crinckle virus Bengal gram: root rot, wilt, *Ascochyta* blight, powdery mildew, rust and stunt.

4	Causal organism, symptoms, favourable conditions and management of diseases of Groundnut : early leaf spot, late leaf spot rust, *Aspergillus* crown rot, stem and pod rot and bud necrosis virus, root rot Sesame - charcoal rot/root or stem rot, *Alternaria* leaf blight, powdery mildew and Phyllody, Wilt
5	Causal organism, symptoms, favourable conditions and management of diseases of Sunflower : *Alternaria* blight, rust, charcoal rot, Rhizopus head rot, and sunflower necrosis virus Castor : wilt, seedling blight, *Alternaria* leaf blight, rust, and *Cercospora* leaf spot Cotton : *Fusarium* wilt, *Verticilium* wilt, root rot, grey mildew, boll rot, *Alternaria* leaf spot, *Cercospora* leaf spot, bacterial blight/black arm and tobacco streak virus
6	Causal organism, symptoms, favourable conditions and management of diseases of Sugarcane - Red rot, smut, rust, ratoon stunting, wilt, sett rot and grassy shoot disease Tobacco - Damping off, Anthracnose, Black shank, powdery mildew, frog eye leaf spot, brown spot, mosaic, leaf curl and orobanche Betalvine - Foot rot or Leaf rot or wilt, *Sclerotium* foot rot and wilt, Powdery mildew, Anthracnose and Bacterial leaf spot or stem rot
7	Causal organism, symptoms, favourable conditions and management of diseases of Mango - Malformation, Powdery mildew, Anthracnose, Dieback, sooty mould, grey blight, Red rust and Phanerogamic parasite - Giant mistletoe Banana - Panama wilt, Sigatoka leaf spot, Anthracnose/fruit rot, Cigar end rot, Moko wilt, Erwinia rot, Bunchy top, Banana bract virus, and infectious chlorosis Grapevine: Downy mildew, powdery mildew, anthracnose/bird eye spot and Grape vine fan-leaf virus.
8	Causal organism, symptoms, favourable conditions and management of diseases of Sapota : Leaf spots, Sooty mould, and flat limp Pomegranate: Leaf spot and fruit spot, cercospora leaf spot, Phomopsis leaf spot, and Bacterial blight. Papaya : Damping off, Foot rot / stem rot, Powdery mildew, Anthracnose, Papaya ring spot and Leaf curl

9	**Mid semester examination**
10	Causal organism, symptoms, favourable conditions and management of diseases of Tomato : Damping off, *Fusarium* wilt, *Verticillium* wilt, Early blight, late blight, Bacterial wilt, Tomato spotted wilt virus and leaf curl virus Chillies : Damping off, Die-back and fruit rot, leaf spot, powdery mildew, Bacterial leaf spot, mosaic, and Leaf curl virus Brinjal : Damping off, *Fusarium* wilt, *Alternaria* leaf spot, Phomopsis blight and fruit rot, Bacterial wilt and Little leaf
11	Causal organism, symptoms, favourable conditions and management of diseases of Bhendi : Powdery mildew, *Cercospora* leaf spot and Vein clearing/yellow vein mosaic virus Cucurbits : Fusarial wilt of watermelon, Root rot, Anthracnose, Downy mildew, Powdery mildew, *Alternaria* blight Angular leaf spot and Cucumber mosaic virus Crucifers: Club root of cabbage, black leaf spot, white rust, Downy mildew and Black rot Amaranthus : white rust or white blister
12	Causal organisms, symptom, favourable conditions and management of diseases of Spices Turmeric: Rhizome rot, *Colletotrichum* Leaf spot and Leaf blotch Garlic : Neck rot and bulb rot, *Macrophomina* rot / Internal bulb rot, Pink root and *Aspergillus* rot Onion : Purple blotch, basal rot, smut, downy mildew andsmudge Potato : Black scurf and stem canker, Early blight, late blight, Black leg and soft rot and brown rot/bacterial wilt/ring disease
13	Causal organisms, symptom, favourable conditions and management of diseases of Plantation crops Coconut : Bud rot, Basal stem rot/Thanjavur wilt, Grey leaf blight, Stem bleeding and Kerala wilt or root wilt Arecanut : *Mahali* disease/Fruit rot, *Anabe roga*/Foot rot, Stem bleeding, Inflorescence die-back and button shedding
14	Causal organism, symptoms, favourable conditions and management of diseases of Plantation crops Coffee : Coffee leaf rust, Collar rot, Black rot or koleroga or thread blight, Anthracnose or die back, Brown eye spot and Root rot Rubber : Powdery mildew, Abnormal leaf fall, Pink diseases and Brown root diseases Tea : blister blight, grey blight, pink disease, black rot, red rust and

	sooty mould
15	Causal organism, symptoms, favourable conditions and management of diseases of Spices Pepper : Quick wilt/Phytophthora foot rot, pollu disease/anthracnose, slow decline/slow wilt and red rust Cardamom : Damping off / rhizome rot / clamp rot,Azhukal disease / capsule rot / fruit rot andChenthal disease / leaf blight Coriander : Wilt,Powdery Mildew and Stem gall
16	Causal organism, symptoms, favourable conditions and management of diseases of flowers crops Rose : powdery mildew, black spot, rust and die back Tuberose : stem rot, leaf blight and flower spot, *Alternaria* leaf spot and flower bud rot Jasmine : *Fusarium* wilt, leaf spot, rust, bacterial leaf spot, collar rot, and phyllody Crossandra – wilt and root rot
17.	Causal organism, symptoms, favourable conditions and management of post-harvest diseases. Fruits: Banana anthracnose, Botrytis Bunch Rot or Gray Mold of Grape, *Phomopsis* fruit rot of guava, Mango Anthracnose, Fruit Rots of papaya Vegetable - Tomato bacterial soft rot and hollow Stem, Brinjal fruit rot and Carrot bacterial soft rot

Practical Syllabus

Identification of symptoms of major diseases of Cereals, Pulses, Oil seeds, Cash crops, Fruits, Vegetables, Plantation crops, Spices and Flowers. Collection and preservation of diseased specimens (Students should submit 50 preserved plant disease specimens)

Practical Schedule

Ex. No.	Contents to be taught/ Dealt
1.	Field diagnosis of infected symptoms, collection and preservation of diseases of Rice - Blast, brown spot, sheath blight and sheath rot
2.	Field diagnosis of infected symptoms, collection and preservation of diseases of Rice - Grain discolouration, false smut, Bacterial leaf blight and Rice tungro virus
3.	Field diagnosis of infected symptoms, collection and preservation of diseases of Sorghum - Downy mildew, leaf light, smut diseases, grain smut, loose smut, long smut, head smut, sugary disease, rust and charcoal

	rot
4	Field diagnosis of infected symptoms, collection and preservation of diseases of Maize - Downy mildew, leaf blight, rust, charcoal rot and post flowering stalk rot
5	Field diagnosis of infected symptoms, collection and preservation of diseases of Cumbu - Downy mildew, leaf spot, ergot or sugary disease, rust and smut Ragi - Blast, leaf blight, smut, downy mildew and mottle streak virus,
6	Field diagnosis of infected symptoms collection and preservation of diseases of Red gram - Fusarium wilt, dry root rot, powdery mildew, stem blight, leaf spot and sterility mosaic virus Bengal gram - Root rot, wilt, *Ascochyta* blight, powdery mildew, rust and stunt.
7	Field diagnosis of infected symptoms collection and preservation of diseases of black gram and greengram - Root rot, wilt, anthracnose, rust, powdery mildew, yellow mosaic and leaf crinckle virus
8	Field diagnosis of infected symptoms collection and preservation of diseases of Cowpea - Root rot, wilt, rust, powdery mildew and aphid borne cowpea mosaic Lab lab –**Anthracnose,** Powdery mildew and rust
9	Field diagnosis of infected symptoms collection and preservation of diseases of Groundnut - Early leaf spot, late leaf spot rust, *Aspergillus* crown rot, stem and pod rot and bud necrosis virus
10	Field diagnosis of infected symptoms collection and preservation of diseases of Sunflower - *Alternaria* blight, rust, charcoal rot, Rhizopus head rot, and sunflower necrosis virus
11	Field diagnosis of infected symptoms collection and preservation of diseases of Sesame - charcoal rot/root or stem rot, *Alternaria* leaf blight, powdery mildew and Phyllody Castor - Casual organism, symptoms, favourable conditions and management of wilt, seedling blight, *Alternaria* leaf blight, rust, and *Cercospora* leaf spot
12	Field diagnosis of infected symptoms collection and preservation of diseases of Cotton - *Fusarium* wilt, *Verticilium* wilt, root rot, grey mildew, boll rot, *Alternaria* leaf spot, *Cercospora* leaf spot, bacterial blight and tobacco streak virus
13	Field diagnosis of infected symptoms collection and preservation of

	diseases of Sugarcane - Red rot, smut, rust, ratoon stunting, wilt, sett rot and grassy shoot disease, pokkah boeng
14	Field diagnosis of infected symptoms collection and preservation of diseases of Tobacco - Damping off, Anthracnose, Black shank, powdery mildew, frog eye leaf spot, brown spot, mosaic, leaf curl and orobanche Betalvine - Foot rot or Leaf rot or wilt, Sclerotium foot rot and wilt, Powdery mildew, Anthracnose and Bacterial leaf spot or stem rot
15	Field diagnosis of infected symptoms collection and preservation of diseases of Banana - Panama wilt, Sigatoka leaf spot, Anthracnose/fruit rot, Cigar end rot, Moko wilt, Bunchy top, Banana bract virus, Erwinia rot and infectious chlorosis
16	Field diagnosis of infected symptoms collection and preservation of diseases of Mango - Malformation, Powdery mildew, Anthracnose, Dieback, sooty mould, grey blight, Red rust and Phanerogamic parasite.
17.	**Mid semester practical examination**
18	Field diagnosis of infected symptoms collection and preservation of diseases of Grapevine - Downy mildew, powdery mildew, anthracnose/bird eye spot and Grape vine fan-leaf virus.
19.	Field diagnosis of infected symptoms collection and preservation of diseases of Papaya - Damping off, Foot rot / stem rot, Powdery mildew, Anthracnose, Papaya ring spot and Leaf curl
20	Field diagnosis of infected symptoms collection and preservation of diseases of Sapota - Leaf spots, Sooty mould, and flat limp Pomegranate - Leaf spot and fruit spot, cercospora leaf spot, Phomopsis leaf spot, and Bacterial blight.
21	Field diagnosis of infected symptoms collection and preservation of diseases of Tomato - Damping off, *Fusarium* wilt, *Verticillium* wilt, Early blight, late blight, Bacterial wilt, Tomato spotted wilt virus and leaf curl virus Chillies - Damping off, Die-back and fruit rot, leaf spot, powdery mildew, Bacterial leaf spot, mosaic, and Leaf curl virus
22	Field diagnosis of infected symptoms collection and preservation of diseases of Brinjal - Damping off, *Fusarium* wilt, *Alternaria* leaf spot, Phomopsis blight and fruit rot, Bacterial wilt and Little leaf Bhendi - Powdery mildew, cercospora leaf spot and Vein clearing/yellow vein mosaic virus

23	Field diagnosis of infected symptoms collection and preservation of diseases of Cucurbits - Fusarial wilt of watermelon, Root rot, Anthracnose, Downy mildew, Powdery mildew, *Alternaria* blight Angular leaf spot and Cucumber mosaic virus Crucifers : Club root of cabbage, black leaf spot, white rust, Downy mildew and Black rot
24.	Field diagnosis of infected symptoms collection and preservation of diseases of Potato - Black scurf and stem canker, Early blight, late blight, Black leg and soft rot, brown rot/bacterial wilt/ring disease Field diagnosis of infected symptoms collection and preservation of diseases of Amaranthus - white rust or white blister
25.	Field diagnosis of infected symptoms collection and preservation of diseases of Spices Turmeric -:Rhizome rot, *Colletotrichum* Leaf spot and Leaf blotch Garlic - Neck rot and bulb rot, *Macrophomina* rot / Internal bulb rot, Pink root and *Aspergillus* rot Onion – purple blotch, basal rot, smut, downy mildew andsmudge
26	Field diagnosis of infected symptoms collection and preservation of diseases of Spices Pepper – quick wilt/Phytophthora foot rot, pollu disease/anthracnose, slow decline/slow wilt and red rust Cardamom - Damping off / rhizome rot / clamp rot,Azhukal disease / capsule rot / fruit rot,Chenthal disease / leaf blight Coriander: Wilt,Powdery Mildew and Stem gall
27	Field diagnosis of infected symptoms collection and preservation of diseases of Plantation crops Coconut - Bud rot, Basal stem rot/Thanjavur wilt, Grey leaf blight, Stem bleeding and Kerala wilt or root wilt Arecanut - *Mahali* disease/Fruit rot, *Anabe roga*/Foot rot, Stem bleeding, Inflorescence die-back and button shedding
28	Field diagnosis of infected symptoms collection and preservation of diseases of Plantation crops Coffee - Coffee leaf rust, Collar rot, Black rot or koleroga or thread blight, Anthracnose or die back, Brown eye spot and Root rot

	Rubber - Powdery mildew, Abnormal leaf fall, Pink diseases and Brown root diseases Tea – blister blight, grey blight, pink disease, black rot, red rust and sooty mould
29.	Field diagnosis of infected symptoms collection and preservation of diseases of flower crop Rose - powdery mildew, black spot, rust and die back Tuberose – stem rot, leaf blight and flower spot, *Alternaria* leaf spot and flower bud rot
30.	Field diagnosis of infected symptoms collection and preservation of diseases of flower crop Jasmine – *Fusarium* wilt, leaf spot, rust, bacterial leaf spot, collar rot, and phyllody Crossandra – wilt and root rot
31.	Field diagnosis of infected symptoms collection and preservation of Post harvest disease of fruits - Banana anthracnose, Botrytis Bunch Rot or Gray Mold of Grape, *Phomopsis* fruit rot of guava, Mango Anthracnose, Fruit Rots of papaya
32	Field diagnosis of infected symptoms collection and preservation of Post harvest disease of vegetable - Tomato bacterial soft rot and hollow Stem, Brinjal fruit rot and Carrot bacterial soft rot
33.	Field diagnosis of infected symptoms collection and preservation of diseases under protected cultivation Fungal disease - Damping off, root rot, Rhizoctonia stem rot, Fusarium wilt, powdery mildew and downy mildew Bacterial disease – angular leaf spot in cucurbits and bacterial canker in tomato Viral diseases – mosaic, tomato yellow leaf curl virus and Tomato spotted wilt virus
34.	**Final practical examination**

Course outcome

The students will be familiarized about the plant diseases, identification of symptoms, causal organisms, favorable conditions and IDM practices for the control of plant diseases.

References

V.Prakasam,V., Valluvaparidasan.,T.Raguchander.,K.Prabakar., Thiruvudainambi. 1997. Field crop diseases, pp :176.

G.Arjunan. 1999. Diseases of Horticultural crops.pp:

AEC D21	Agricultural Economics, Finance and Marketing	(1+1)

Objectives

1. To impart knowledge on basic aspects of agricultural economics, finance and marketing.
2. To enable the students to have practical exposure on various aspects of farm management, marketing and financial institutions.

Theory syllabus

Concepts in Agricultural Economics

Agricultural Economics – Meaning, importance and scope; Supply – Demand, Law of Supply and Law of Demand and factors affecting it; Micro and Macroeconomics: Sectors of Economy – Primary, Secondary and Tertiary sectors; GDP, Per-capita income, Money, Tax (Direct and Indirect, Progressive and Proportional),GST-, Inflation, Whole sale price index.

Farm Management

Farm Management: Definition, Objectives, Scope, Farm Management Decision Types of resources: stock, flow, renewable and non-renewable; Types of farming: Specialized, Diversified and Mixed farming and Systems of farming: Peasant, Capitalistic, State, Collective and Cooperative; Factors of Production: Land, Labour, Capital and Organization; Cost Concepts: Fixed cost, Variable cost, Total cost, Average cost and Marginal cost; Farm Planning, Risk and Uncertainty – Types and measures to reduce risk.

Agricultural Finance

Agricultural Finance: Need and Classification of Credit based on time; Financial Institutions: Institutional and Non-institutional Finance; Institutional Credit Sources: Functions of NABARD, Regional Rural Banks, Land Development Banks, Commercial banks and Cooperatives (PACB, DCCB, SCB); Non- Institutional Credit Sources: Functions of Private money lenders, Relatives, Friends, Chit funds; Agricultural Insurance: National Agricultural Insurance Scheme (NAIS), Pradhan Mantri Fasal Bima Yojana (PMFBY).

Agricultural Marketing

Market, Marketing and Agricultural Marketing –Scope and Importance and Characteristics of Agricultural Commodities; Classification of Agricultural Market based on Market area (Local, Regional, National and International) and Marketing Functions; (Primary, Secondary and Facilitative), Major Marketing functionaries (Village trader, Wholesaler, Commission Agent, Processor, Retailer); Producer Surplus (Marketable and Marketed), Marketing channel, Marketing costs, Marketing margins and Price spread; Major Markets for each

commodity, e-Market, e-NAM, Administered Prices: Minimum Support Prices, Fair and Remunerative Price (FRP), State Advisory Prices (SAP).

Lecture Schedule

Lecture No.	Contents to be taught
1.	Economics, Agricultural Economics – Meaning, importance and scope.
2.	Demand &Supply, Law of Demand Law of Supply and factors affecting it.
3.	Micro and Macroeconomics: Sectors of Economy – Primary, Secondary and Tertiary sectors.
4.	GDP, Per-capita income, Money, Tax (Direct and Indirect, Progressive and Proportional), GST-, Inflation, Whole sale price index.
5.	Farm Management: Definition, Objectives, Scope, Farm Management Decision; Types of resources: stock, flow, renewable and non-renewable.
6.	Types of farming: Specialized, Diversified and Mixed farming and Systems of farming: Peasant, Capitalistic, State, Collective and Cooperative.
7.	Factors of Production: Land, Labour, Capital and Organization; Cost Concepts: Fixed cost, Variable cost, Total cost, and Marginal cost.
8.	Farm Planning, Risk and Uncertainty – Types and measures to reduce risk.
9.	**Mid Semester Examination**
10.	Agricultural Finance: Need and Classification of Credit based on time; Financial Institutions: Institutional and Non-institutional Finance.
11.	Institutional Credit Sources: Functions of NABARD, Regional Rural Banks, Land Development Banks, Commercial banks and Cooperatives (PACCS, DCCB, SCB).
12.	Non- Institutional Credit Sources: Functions of Private money lenders, Relatives, Friends
13.	Agricultural Insurance: History, National Agricultural Insurance Scheme (NAIS), Pradhan Mantri Fasal Bima Yojana (PMFBY). and Agricultural Insurance Company,
14.	Market, Marketing and Agricultural Marketing –Scope and Importance and Characteristics of Agricultural Commodities.
15.	Classification of Agricultural Market based on Market area (Local, Regional, National and International) and Marketing Functions; (Primary, Secondary and Facilitative), Major Market functionaries (Village trader, Wholesaler, Commission Agent, Processor, Retailer).
16.	Producer Surplus (Marketable and Marketed), Marketing channel, Marketing costs, Marketing margins and Price spread.
17.	Major Markets for each commodity, e-Market, e-NAM, CACP, Administered Prices: Minimum Support Prices, Fair and Remunerative Price (FRP), State Advisory Prices (SAP).

Practical Syllabus

Visit to farm to learn about farm layout, resource endowments (farm buildings, machineries, livestock's, irrigation facilities etc) present in the farm; Estimation of Cost of Cultivation and Cost of Production through CACP approach for Agricultural and Horticultural crops; Visit to agricultural farm to study various farm records: DMS, Input Registers, Muster Roll, Stock Registers etc; Calculation of depreciation of farm assets through Straight line method and Prepare a Net worth Statement for the farm that you have visited; Preparation of Partial budget, Enterprise budget and Complete budget; Visit / Guest Lecture on Primary Agricultural Co-operative Bank (PACB) to study its functions; Preparation of bankable projects / Business plan for agro based commercial units establishment; Procedure for establishment and functioning of Self-Help Group, FPO, Commodity groups and Contract farming; Visit to Farmers' market, Wholesale market and Input retail shop to study market structure, market channel and estimation of Price Spread; Guest Lecture / Visit to study the role and functions of Regulated market; Guest Lecture / Visit to AGMARK Lab to study grading and quality norms for agricultural products; Visit to Warehouse – CWC / SWC; Marketing Institutions - State Agricultural Marketing Boards, TANFED, FCI and Commodity Boards; Schemes in Agricultural, Horticultural, Animal husbandry and Fisheries Department and Procedure for Organic Certification; Marketing information and intelligence, Sources of data; Collection of price data for agricultural / horticultural produces and estimation of seasonal index

Practical Schedule

Ex.No	Contents to be taught
1.	Visit to farm to learn about farm layout, resource endowments (farm buildings, machineries, livestock's, irrigation facilities etc) present in the farm and preparation of Interview Schedule.
2.	Estimation of Cost of Cultivation and Cost of Production through CACP approach for Agricultural and Horticultural crops.
3.	Visit to agricultural farm to study various farm records: DMS, Input Registers, Muster Roll, Stock Registers etc.
4.	Calculation of depreciation of farm assets through Straight line method and Prepare a Net worth Statement for the farm that you have visited.
5.	Preparation of Partial budget, Enterprise budget and Complete budget.
6.	Preparation of bankable projects / Business plan for agro based commercial units establishment.
7.	Procedure for establishment and functioning of Self-Help Group, FPO, Commodity groups and Contract farming
8.	Visit / Guest Lecture on Primary Agricultural Co-operative Credit Societies (PACCS) to study its functions.

9.	**Mid-Semester practical Examination**
10.	Visit to Farmers' market, Wholesale market and Input retail shop to study market structure, market channel and estimation of Price Spread.
11.	Guest Lecture / Visit to study the role and functions of Regulated market and e-NAM.
12.	Guest Lecture / Visit to AGMARK Lab to study grading and quality norms for agricultural products.
13.	Guest Lecture/Visit to Warehouse – CWC / SWC
14.	Marketing Institutions - State Agricultural Marketing Boards, TANFED, FCI and Commodity Boards.
15.	Schemes in Agricultural, Horticultural, Animal husbandry and Fisheries Department and Procedure for Organic Certification.
16.	Marketing information and intelligence, Sources of data; Collection of price data for agricultural / horticultural produces and estimation of seasonal index
17.	**Final Practical Examination**

Course Outcome

At the end of this course the students would have gained theoretical and practical knowledge on various aspects pertaining to farm management and marketing of agricultural commodities which has been a core issue in the agricultural business. The supporting basic principles of agricultural economics, farm management and agricultural finance will guide the students during their field work.

References

1. Subba Reddy. S, Raghu Ram. P., Neelakanta Sastry. T.V and I. Bhavani Devi, 2004, Agricultural Economics, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Johl, S.S & Kapoor, T.R. 1973. Fundamentals of Farm Business Management. Kalyani Publishers. Ludhiana.
3. Subba Reddy, S and P. Raghu Ram. 2011. Agricultural Finance and Management. Oxford & IBH. New Delhi.
4. Acharya S.S. and N.L.Agarwal. 2002. Agricultural Marketing in India. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

TAMIL NADU AGRICULTURAL UNIVERSITY

DIPLOMA IN AGRICULTURE

IV SEMESTER

S.No	Course No.	Course Title	Credit Hours
1	AGR D23	Dry Farming and Agro forestry	1+1
2	AGR D24	Crop Production - II	0+2
3	AGB D22	Breeding of Field Crops	1+1
4	HOR D21	Floriculture, Medicinal plants, Spices and Plantation crops	2+1
5	AMP D21	Fundamentals of Livestock and Poultry Management	2+1
6	CAG D22	Commercial Agriculture - II	0+2
7	AEX D21	Extension Education and Transfer of Technology	1+1
8	AEX D22	Study Tour	0+1
		Total	**7+10=17**

AGR D23	Dry Farming and Agroforestry	(1+1)

Objectives

- To expose the students on various principles and practices of dryland agriculture, this plays a major role in crop production.
- To explain the importance and scope of forestry technologies in dryland agriculture improvement.

Theory syllabus

Dry Farming - Present Status in Tamil Nadu - Soils of Dry Farming Tracts - Important Crops of Dry Land Areas of Tamil Nadu - Dry Land Technology for increased Crop Productivity – Pre monsoon sowing - Alternate land Use in Dry Land Tracts of Tamil Nadu - Integrated Farming Systems in drylands of Tami Nadu - Weather aberrations and Contingent Crop Planning –Drought - Erosion – Water and Wind Erosion – Land Slide – Contour Bund, Graded Bund, Bench Terrace, Contour Stone Wall - Gully Control Structures – Water Harvest – Watershed management - Land use classification – Role of Forests - Indian forests – Status - Classification of Forestry – Agroforestry – Social and Urban Forestry - Mixed Wood Lots - Shifting Cultivation – Taungya – Alley cropping – Wind Break and Shelter Belts - Trees for Problem Soils – Social Forestry Projects in Tamil Nadu - Industrial Agroforestry – Waste land development – Management Practices for Multi Purpose Trees - Teak, Casuarina, Neem, Bamboo, Acacia

Theory schedule

LectureNo.	Contents to be taught
1.	Dry farming - Definition – Characteristics - Types - Dry farming, dry land farming, rainfed farming - Development and significance of dry farming in India - Present Status in Tamil Nadu
2.	Soils of dry farming tracts - Vertisols (black soil), Alfisols (Red soil), Aridisols (Sierozemic soils), Entisols (Alluvial soils), Inceptisols and their role in crop production – Important crops of dry land areas of Tamil Nadu
3.	Suitable dry land technology for increased crop productivity – Pre monsoon sowing - Techniques to reduce evaporation and transpiration loss
4.	Alternate land Use in dry land tracts of Tamil Nadu - Agro-forestry - Agri-horticulture - Silvi-pastoral system - Farm Forestry
5.	Integrated Farming Systems in drylands of Tami Nadu – Advantages – Components – Resource recycling

6.	Weather aberrations - Contingent crop planning – Early onset of monsoon, dry spell immediately after sowing, delayed or late onset of monsoon, early cessation of rains, extended monsoon - Drought – Types and their effect on crop production – Management of drought
7.	Erosion – Classification of Erosion – Water and Wind Erosion – Estimation of soil loss - Land Slide – Contour Bund, Graded Bund, Bench Terrace, Contour Stone Wall
8.	Gully Control Structures – Cultivation Practices – Water Harvest – Farm Ponds – Percolation Ponds – Watershed management - Definitions, types and components
9.	**Mid semester examination**
10.	Land use classification – Role of Forests - Indian forests – Status
1.1	Forestry – Classification – Agroforestry, social forestry and urban forestry – Definition – Advantages and constraints
12.	Agroforestry Systems – Primary Systems – Agrisilviculture, Silvipasture, Agrisilvipasture – Mixed Wood Lots
13.	Sub Systems – Shifting Cultivation – Taungya – Home Gardens – Alley cropping – Wind Break & Shelter Belts
14.	Trees for problem soils – Sand – Sand Dune Stabilization – Social Forestry Projects in Tamil Nadu
15.	Industrial Agroforestry – Pulp wood species- *Eucalyptus,*, match wood species -*Ailanthus*, bio-fuels –*Pogamia,**Simarouba,**Jatropha* and sandal woods - Waste land development – types of waste lands and management practices
16.	Cultivation practices for Multi Purpose Trees - Teak, Casuarina
17.	Cultivation practices for Multi Purpose Trees - Neem, Bamboo, Acacia

Practical syllabus

Drought management technologies -Mapping of semi arid and arid tracts - Demonstration of seed hardening – Identifying and practicing dry farming implements - Preparation of contingency crop plan - Length of growing period and pre monsoon sowing – IFS for dryland ecosystem - Visit to watershed area - Skill learning in dryland soil moisture conservation practices - Identification of forest trees - Nursery practices for forest trees - Lay out of major agroforestry system - Economics of tree cultivation - Visit to wasteland development project sites

Practical schedule

Ex No.	Contents to be taught

1.	Mapping of semi arid and arid tracts of Tamil Nadu
2.	Drought management technologies in dry land agriculture
3.	Demonstration of seed hardening of different crop seeds
4.	Listing and identifying dry farming implements
5.	Practicing implements in dryland agriculture
6.	Preparation of contingency crop plan for aberrant rainfall situations
7.	Working out length of growing period and deciding pre monsoon sowing
8.	Preparation of integrated farming systems for dry land eco system
9.	**Mid semester practical examination**
10.	Visit to watershed area
11.	Skill learning in dryland soil moisture conservation practices
12.	Identification and description of forest trees
13.	Acquiring skill in nursery practices for forest trees
14.	Planning and lay out of major agroforestry system
15.	Economics of tree cultivation – Teak, Casurina, *Eucalyptus*, *Melia*
16.	Visit to wasteland development project sites and learning development practices
17.	**Final Practical examination**

Course outcome

This is a unique course deals on principles and concepts of dry farming and also deals forestry including different agro forestry systems. Specialization in these area helps to get jobs in nursery firms and useful for becoming an entrepreneur dry farming agriculture and forest nursery.

References / Text books

Govindan, K. and V. Thirumurugan. 2003. Principles and practices of dryland agriculture. Kalyani Publishers, Chennai

Jayanthi, C., Devasenapathy,P. and Vennila,C. 2007. Farming systems - Principles and practices. Sathish Serial Publishing House, New Delhi

AGR D24	Crop Production- II	(0+2)

Objectives

To learn and acquiring skill on the package of practices of low land rice/ irrigated upland crop.

Practical schedule

The students will learn crop cultivation by doing themselves. Each student will be allotted with a piece of land and do all field operations from field preparation to harvest in the allotted field. Each student will record the observation like germination percentage, plant population, plant height at different stages of the crops, days to 50% flowering, number of grains per panicle, test weight of grains, recording the plot yield and working out the cost of cultivation. The student will maintain cultivation sheet and record of work done with biometric observations and comments on various operations performed and factors of production. The student will raise one crop. It may be either lowland rice or irrigated upland crop according to their season and resource availability. There should not be repetition of crop in both AGR A22 Crop production – I (0+2) and AGR A24 Crop production II (0+2). However, rice is the compulsory crop to be raised in either AGR A22 Crop production – I (0+2) or AGR A24 Crop production- II (0+2).

Course Outcome

Learning agronomic practices and acquiring skill by practicing the techniques.

References / Text Books

Crop production guide. 2012. Tamil Nadu Agricultural University and Department of Agriculture, Government of Tamil Nadu.

AGB D22	Breeding of Field Crops	(1+1)

Objective

To acquire the practical knowledge of breeding methods of different field crops.

Theory syllabus

Breeding methods in rice, wheat, maize, sorghum, cumbu, small millets, redgram, blackgram & greengram, cowpea, other pulses, groundnut, sesame, sunflower, castor, coconut, cotton, sugarcane, forage crops.

Theory schedule

Lecture No.	Contents to be taught
1.	Breeding methods in Rice - Origin, family, chromosome number, mode of pollination,economic part, economic importance,breeding objectives and methods.
2.	Breeding methods in Wheat - Origin, family, chromosome number, mode of pollination,economic part, economic importance,breeding objectives and methods.
3.	Breeding methods in Maize - Origin, family, chromosome number, mode of pollination, economic part, economic importance,breeding objectives and methods.
4.	Breeding methods in Sorghum - Origin, family, chromosome number, mode of pollination, economic part, economic importance,, breeding objectives and methods.
5.	Breeding methods in Cumbu - Origin, family, chromosome number, mode of pollination, economic part, economic importance,, breeding objectives and methods.
6.	Breeding methods in Small millets - Origin, family, chromosome number, mode of pollination,economic part, economic importance,, breeding objectives and methods.
7.	Breeding methods in Redgram - Origin, family, chromosome number, mode of pollination,economic part, economic importance,, breeding objectives and methods.
8.	Breeding methods in Blackgram and Greengram - Origin, family, chromosome number, mode of pollination, economic part, economic importance,, breeding objectives and methods.
9.	**Mid semester Examination**

10.	Breeding methods in Cowpea and other pulses - Origin, family, chromosome number, mode of pollination, economic part, economic importance,, breeding objectives and methods.
11.	Breeding methods in Groundnut and Sesame - Origin, family, chromosome number, mode of pollinationeconomic part, economic importance,, breeding objectives and methods.
12.	Breeding methods in Sunflower - Origin, family, chromosome number, mode of pollination, economic part, economic importance,, breeding objectives and methods.
13.	Breeding methods in Castor - Origin, family, chromosome number, mode of pollination,economic part, economic importance,, breeding objectives and methods..
14.	Breeding methods in Coconut - Origin, family, chromosome number, mode of pollinationeconomic part, economic importance,, breeding objectives and methods.
15.	Breeding methods in Cotton - Origin, family, chromosome number, mode of pollination,economic part, economic importance,, breeding objectives and methods..
16.	Breeding methods in Sugarcane - Origin, family, chromosome number, mode of pollination, economic part, economic importance,, breeding objectives and methods.
17.	Breeding methods in Forage Crops - Origin, family, chromosome number, mode of pollination,economic part, economic importance,, breeding objectives and methods.

Practical Syllabus

Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Rice, maize, sorghum, cumbu, small millets, redgram, blackgram & greengram, cowpea, other pulses, groundnut, sesame, sunflower, castor, coconut, cotton, sugarcane, forage crops, field visit to breeding research trials and herbarium collection.

Practical schedule

Ex.No.	Contents to be taught
1.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Rice
2.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Maize
3.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Sorghum
4.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Cumbu

5.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Small millets
6.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Redgram
7.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Blackgram, Greengram, Cowpea and other pulses
8.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Groundnut and Sesame
9.	**Mid semester Practical Examination**
10.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Sunflower
11.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Castor and Coconut
12.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Cotton
13.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Sugarcane
14.	Floral Biology, Anthesis, Selfing and crossing techniques and achievements in Forage crops
15.	Visit to hybrid / varietal seed production field
16.	Visit to Breeding Research Station/Herbarium collection
17.	**Final Practical Examination**

Course Outcome

Students will be familiarized with all the plant breeding techniques and methods and their achievements in various crops

References

- Singh, B.D. 2013. Plant breeding - Principles and methods. Kalyani Publishers, New Delhi.
- Phundhan Singh. 2015. Essentials of plant breeding(5th edition), Kalyani publishers, New Delhi.
- Chopra, V. L., 1994. Plant breeding theory and practice. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi
- Sharma, J.R. 1994. Principles and practice of Plant Breeding. Tata McGraw - Hill Publishing Co. Ltd., New Delhi

Web resources

- http://agritech.tnau.ac.in
- http://www.agriinfo.in
- http://www.edugreen.teri.res.in/explore/bio/breed.htm
- http://www.iaea.org/
- www.nbpgr.nic.in

HOR D21	Floriculture, Medicinal, Aromatic, Spices and Plantation crops	(2+1)

Objective

To understand the production, management and post harvest practices in Floriculture, Medicinal plants, Spices and Plantation crops.

Theory syllabus

Definition – area and production – package of practices including soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, grading and packing offlower crops- rose (loose flower), jasmine, chrysanthemum, marigold, tuberose, crossandra and cockscomb. Garden designs, formal and informal styles of gardening, components of landscape garden, preparing ornamental garden design for home, lawn making and maintenance, Important flowering annuals and foliage shrubs, flowering and foliage trees, herbaceous perennials, cacti, succulents, climbers and creepers, bulbous plants, edges and hedges. Indoor plants and interior decoration, cut flowers, flower arrangement, bonsai culture and dry flower decoration.

Definition – area and production – package of practices including soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing of medicinal plants – coleus, gloriosa, ashwagandha, senna, keelanelli, aloe, ocimum, achorus.

Definition – area and production – package of practices including soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing, value added products of Spices and Plantation crops - black pepper, cardamom, clove, nutmeg, cinnamon, allspice, tamarind, turmeric, ginger, coriander, fenugreek, coffee, tea, coconut, arecanut, cocoa, rubber and cashew.

Theory Schedule

Lecture No.	Contents to be taught/ Dealt
1	Definition – Area and production of flower crops, medicinal plants, spices and plantation crops
2	Package of practices for rose (loose flower) Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, grading and packing.
3	Package of practices for jasmine Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, grading and packing, concrete/oil extraction.
4	Package of practices for chrysanthemum

	Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, grading and packing.
5	Package of practices for tuberose Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, grading and packing.
6	Package of practices for marigold, crossandra and cockscomb Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, grading and packing.
7	Garden designs, formal and informal styles of gardening Hindu garden, Mughal garden, British garden, French garden & Japanese garden
8	Components of landscape garden Plant components- Edge (Herbs), Hedges, Shrubs, Palms, Arboretum, Topiary, Carpet beds**,** Trees, Annuals, Climbers and creepers, Flower beds and Borders**,** Trophy and Non plant components – Road, Bridges, Rock garden, Two level garden/Formal garden, Bower Sunken garden, Thatched huts Fountains, Foot paths, Steps, Water garden, Conservatory, Glass house, Garden adornments.
9	Preparing ornamental garden for homeIntroduction, Importance, Layout of home garden, Small and Bungalow garden.
10	Lawn making and maintenanceDefinition, uses, important characteristics of lawn, different species of grass for plains and hills, Shade loving grass, Ideal site for lawn, Seed sowing, Dibbling of roots, Turfing, turf plastering, irrigation, fertilizer, weeding, special practices in lawn, Problems in Lawn and Austro turf.
11	Important flowering annuals and herbaceous perennialsDefinition, importance, Classification, Hints for raising of annuals, seed production techniques in annuals, list of annuals and herbaceous perennials
12	Foliage and flowering shrubsDefinition, Importance, list of flowering and foliage shrubs in tropical condition
13	Foliage and flowering treesDefinition, Importance, classification of trees, list of flowering and foliage trees in tropical condition
14	Cacti, succulents, climbers and creepersDefinition, Importance, list of flowering and foliage creepers and climbers, list of Cacti, succulents
15	bulbous plantsDefinition, Importance, , Flowering and foliage bulbous plants
16	Indoor plants and interior decorationIndoor plants, Importance, Selection of house plants, Climbing and trailing foliage plants, Bushy and upright foliage plants and Flowering house plants, watering, fertilizer, cleaning and plant protection
17.	Cut flowers, Importance, List of cut flowers and open field cut flowers
18.	**Mid semester examination**
19.	Flower arrangementFresh flower arrangement, western styles of flower arrangement, different models in flower arrangement, Eastern or Japanese styles
20.	Bonsai cultureIntroduction, principles of bonsai, plants suitable for bonsai, styles of bonsai, propagation, Season, containers, potting media, potting and repotting, Training, Pruning and Pinching, Wiring, Bending, Watering and Nutrition

21.	Dry flower decorationIntroduction, Advantages, Indian dry flower markets, Harvesting stage of flowers and foliage, materials requirement, Drying techniques, Dry flower products
22.	Package of practices for coleus and gloriosaSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
23.	Package of practices for ashwagandha and sennaSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
24.	Package of practices for ocimum and aloeSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
25.	Package of practices for **vetiver, lemon grass and geranium**,achorus and keelanelliSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
26.	Package of practices for black pepper and cardamomSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
27.	Package of practices for turmeric and gingerSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
28.	Package of practices for coriander, fenugreek and tamarindSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
29.	Package of practices for clove, nutmeg, cinnamon and allspiceSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
30.	Package of practices for coffeeSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
31.	Package of practices for teaSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
32.	Package of practices for coconutSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
33.	Package of practices for cashew and arecanutSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
34.	Package of practices for cocoa and rubberSoil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing

Practical syllabus

Propagation techniques in rose (loose flower), jasmine, chrysanthemum, marigold, tuberose, crossandra- Nursery practices of flowering annuals - Identification and propagation of shrubs, creepers and climbers- preparing ornamental garden design for home - Identification of different medicinal Crops - Propagation techniques of

major medicinal plants -Nursery practices of turmeric, coriander, fenugreek, coconut and cashew- Visit to coconut nursery/plantation - visit to commercial flower field.

Practical schedule

Ex. No	Contents to be taught/ Dealt
1.	Propagation techniques in rose (loose flower) and jasmine. Cuttings – soft wood, Semi hard wood, Hard wood cuttings preparation, Dipping with rooting hormone, planting, rooting – hardening
2.	Propagation techniques in chrysanthemum and marigold. Terminal cuttings/Suckers – marigold – protray – media proportion, seed rate-seed treatment – sowing - maintenance
3.	Propagation techniques in tuberose and crossandra. Characteristics of bulbs, bulbs treatment, Planting. Crossandra – Seed collection and sowing.
4.	Nursery practices of flowering annuals protray – media proportion, seed rate- seed treatment – sowing - maintenance
5.	Identification of shrubs Indentify the important foliage and flowering shrubs in tropical condition
6.	Identification of creepers and climbers. Identify the important creepers and climbers in tropical condition
7.	Preparing ornamental garden design for home(Introduction, Importance, Layout of home garden, Small and Bungalow garden)
8.	Identification of different medicinal and aromatic plants. Identify the medicinal plants - coleus, gloriosa, ashwagandha, senna, keelanelli, aloe, ocimum, achorus**,** lemon grass, vetiver, geranium
9.	**Mid semester practical examination**
10.	Propagation techniques of major medicinal plants and aromatic plants. Sexual and asexual method of propagation
11.	Nursery practices of turmeric, different methods of asexual propagation, Selection of Suitable site for turmeric nursery
12.	Raising of coriander and fenugreek. Seeds – seed treatment – sowing - maintenance
13.	Nursery Practices for coconut and cashew. Important characteristics of mother palm selection and nursery management
14.	Nursery Practices for arecanut and rubber. Important characteristics of mother palm selection and nursery management
15.	Visit to coconut nursery/plantation
16.	Visit to commercial flower field
17.	**Final practical Examination**

Course outcome

The students will be familiarized with production, management and post harvest technologies in Floriculture, Medicinal plants, Spices and Plantation crops in advanced manner.

References/ Text books

1. Kumar.N, 2005, Introduction to spices, plantation crops, medicinal and aromatic plants. 2nd Edition. Oxford & IBH publishers, New Dehi
2. www.tnau.ac.in
3. Randhava, G.S., and A Mukhopadhyay, 1998 Floriculture in India, Allied Publishers Limited. New Delhi
4. Desh Raj, 2013, Floriculture at glance. Kalyani Publishers, New Delhi

AMP D21	Fundamentals of Livestock and Poultry Management	(2+1)

Objectives

To know the basic livestock production such as cattle, buffalo, sheep, goat, swine and poultry for productive and reproductive performance to improve the income of rural farmers and proper utilization of livestock wastes for agriculture.

Theory syllabus

Importance of livestock and poultry in agriculture – livestock and poultry census – milk , meat and egg production status in India – common terminologies in livestock and poultry – various systems of livestock production – extensive , semi – intensive, intensive and Integrated farming system.

Dairy management – Important breeds of cattle and buffaloes – Redsindhi, jersey, Holstein Friesian, kangeyam and umblacherry - Buffalo – murrah. Classification of breeding system – importance of cross breeding and up grading. Definition of oestrus cycle – signs of heat – definition of Artificial insemination – merits and demerits – optimum time of artificial Insemination. Housing Management– selection of site – Types of housing – single row – double row – head to head – tail to tail – merits and demerits. Care and management of new born calves – importance of colostrums feeding – management of pregnant and lactating animals. Methods of milking – hand milking – full hand method & stripping – machine milking and its advantages. Importance of clean milk production. Definition of Ration – balanced feeding of dairy cattle – Importance of green fodder. Classification of disease – prevention and control of Foot and mouth disease, mastitis, haemorrhagic septicemia – prevention of metabolic diseases – milk fever, bloat and ketosis.

Sheep and goat management – Important breeds of sheep – Ramnad white, mecheri, vembur and trichy black –Important Goat breeds – Salem black, kanni adu , kodi adu, Tellicherry and Jamunapari. Systems of rearing – extensive – semi intensive, intensive and tethering. Types of housing – elevated type -deep litter. Care and management of young and adult stocks. Common tree fodders for sheep and goat. Prevention and control of diseases – PPR, Enterotoxaemia, blue tongue and anthrax.

Swine Management – Breeds of swine – large white Yorkshire – housing management. Care and management of new born piglets – piglet anemia – creep feeding. Feeding management of sow and boar – swill feeding. Prevention and control of diseases – swine fever and foot and Mouth disease.

Poultry management – Definition of broiler , layer and backyard poultry – housing systems – cage and deep litter system. Care and management of broiler and layer – composition of broiler and layer ration. Prevention and control of Ranikhet disease, E – coli and coccidiosis.

Lecture schedule

Lecture No.	Contents to be taught
1	Importance of livestock and poultry in agriculture – livestock and poultry census – milk, meat and egg production status in India.
2	Common terminologies used in livestock and poultry
3	Various systems of livestock production – extensive, semi – intensive, intensive and Integrated farming system.
4	Important breeds of cattle and buffaloes – Breed characters of Redsindhi, Jersey, Holstein Friesian,
5	Breed characters of kangayam cattle, umbalachery cattle and Murrah buffalo
6	Classification of breeding system – Importance, advantages of cross breeding and up grading.
7	Definition of oestrus cycle – signs of heat of all livestock species
8	Definition of Artificial insemination – merits and demerits – optimum time of artificial Insemination.
9	Housing Management– selection of site – Types of housing – single row – double row – head to head – tail to tail – merits and demerits.
10	Care and management of new born calves – importance of colostrums feeding
11	Management of pregnant and lactating animals.
12	Methods of milking – hand milking – full hand method & stripping – machine milking and its advantages.
13	Importance of Clean milk production, pasteurization and its technology.
14	Definition of Ration – balanced feeding of dairy cattle – Importance of green fodder.
15	Classification of disease – prevention and control of Foot and mouth disease, mastitis, haemorrhagic septicemia
16	Prevention of metabolic diseases – milk fever, bloat and ketosis.
17	**Mid semester Examination**
18	Important breeds of sheep breeds – Ramnad white, Madras red, Coimbatore, Mecheri, vembur and Trichy black. Important Goat breeds – Salem black, kanni adu, kodi adu, Tellicherry and Jamunapari.
19	Systems of rearing – extensive – semi intensive, intensive and tethering.
20	Types of poultry housing – deep litter shed and Elevated type shed – advantages and disadvantages
21	Care and management of young and adult stocks.
22	Common tree fodders for sheep and goat
23	Prevention and control of diseases – PPR, Enterotoxaemia, blue tongue and anthrax.
24	Breeds of swine – Breed characters of large white Yorkshire

25	Housing management in pigs – floor space requirement for piglets, sow and boar.
26	Care and management of new born piglets – piglet anemia – creep feeding.
27	Feeding management of sow and boar – swill feeding.
28	Prevention and control of diseases – swine fever and foot and Mouth disease.
29	Introduction and Definition of broiler , layer and backyard poultry farming
30	Housing systems – cage and deep litter system. Merits and demerits – litter management in broiler housing
31	Care and management of broiler – brooding, feeding, lighting, housing and disease prevention and control measures
32	Care and management of layer - brooding, feeding, lighting, housing and disease prevention and control measures
33	Composition and formulation of ration – pre starter, starter and finisher for broilers: chick mash, grower mash and layer mash for layers
34	Prevention and control of Ranikhet disease, E – coli and coccidiosis.

Practical syllabus

External parts of livestock and poultry – Identification methods of livestock and poultry – common restraining methods of livestock (Nose string, milk man's rope, bull nose ring, bull leader, calf muzzle trevis) – Methods of disbudding in calves and methods of castration in cattle , sheep and goat – Determination of age by dentition method in cattle , sheep and goat – Study of type and design of livestock and poultry houses – Selection and judging of dairy cattle – Estimation of specific gravity, fat percentage, total solids and solid not fat – Classification and identification of feeds and fodders – Economics of Dairy cattle, sheep and goat farming – Economics of layer and broiler farming – Preparation of brooder house and chicks management -Identification of good layer and poor layer in poultry – Demonstration of Beak trimming, delousing , deworming and vaccination of poultry – Visit to various livestock and poultry farm.

Practical Schedule

Ex.No	Content to be taught
1	External parts of livestock and poultry
2	Identification methods of livestock and poultry
3	Common restraining methods of livestock
4	Demonstration of disbudding in calves and castration in cattle , sheep and goat

5	Determination of age by dentition method in cattle, sheep and goat
6	Study of type and design of livestock and poultry houses
7	Selection and judging of dairy cattle
8	Estimation of specific gravity, fat percentage, total solids and solid not fat
9	**Mid semester Practical Examination**
10	Classification and identification of feeds and fodders
11	Economics of Dairy cattle, sheep and goat farming
12	Economics of layer and broiler farming
13	Preparation of brooder house and chicks management
14	Identification of good layer and poor layer in poultry
15	Demonstration of Beak trimming, delousing , deworming and vaccination of poultry
16	Visit to various livestock and poultry farm.
17	**Final practical examination**

Course outcome

The students will be familiarized with different animal breeds and poultry management.

References:

Banergee, 2019, G.C, A Text Book of Animal Husbandry.

A Handbook of Animal Husbandry and Dairying, ICAR Publications.

AEX D21	Extension Education and Transfer of Technology	(1+1)

Objectives

To develop knowledge on extension education system, extension methods communication pattern, e- extension, rural institution, Adopter categories and its consequences.

In addition, to impart the skill to the students on demonstration techniques, PRA tools, SWOC analysis, Interview schedule preparation etc. to assess the spread and acceptance of crop varieties and technologies released from Tamil Nadu Agricultural University.

Theory Syllabus

Extension and Extension Teaching Methods

Extension - Definition, Agricultural Extension – Principles for successful extension work; Extension Teaching Methods – Classification according to Use and form; Individual Contact Methods – Farm and Home Visit, Farmers Call, Personal Letter, Result Demonstration; Group Contact Methods – Method Demonstration, Study Tour, Field Day, Group Meetings; Mass Contact Methods – Radio, Television, Newspaper, Exhibition, Campaign.

Communication, Programme Planning and Training

Communication – Meaning, Definition, Types, Elements of Communication, Models – Aristotle, Berlo, Paul Leagans models; Programme Planning - Concepts, Programme Planning Cycle; Training – Definition, Types, Functions of FTC, KVK, EEI, MANAGE.

e-Extension, Audio Visual Aids and PRA

Community Radio, Agri Portal, Information Kiosk, KCC, Mobile phones, Expert System, VKC, DEMIC, ATMA, ATIC; Audio Visual Aids - Audio, Video and Audio visual, Advantages and Disadvantages; Participatory Extension – PRA Tools, Transect walk, Seasonal calendar, Venn Diagram, Resource mapping, Matrix ranking - SWOC Analysis.

Rural Sociology

Rural Sociology – Definitions, Meaning, Rural vs Urban differences; Leader-Leadership – Definitions, Types of leader and Characteristics, Qualities of leader Motivation - Definition, Functions of Motivation; Rural Institutions –Co-operatives, Voluntary organisation, NGO'S, Youth Club, SHG, FDG, FIG, CIG, FPO; Extension System in India – CDP, NES, Pachayat Raj System.

Adoption and its Consequences

Adoption-Definitions, Stages of Adoption - Adopter Categories and their Characteristics; Consequences of Adoption – Social Change, Social Values and Social Distance

Theory Schedule

Lecture No.	Content to be taught
1.	Extension - Definition, Agricultural Extension – Principles for successful extension work.
2.	Extension Teaching Methods – Classification according to use and form.
3.	Individual Contact Methods – Farm and Home Visit, Farmers Call, Personal Letter, Result Demonstration.
4.	Group Contact Methods – Method Demonstration, Study Tour, Field Day, Group Meetings.
5.	Mass Contact Methods – Radio, Television, Newspaper, Exhibition, Campaign.
6.	Communication – Meaning, Definition, Types, Elements of Communication, Models – Aristotle, Berlo, Paul Leagans models and Public speaking
7.	Programme Planning - Concepts, Programme Planning Cycle.
8.	Training – Definition, Types, Functions of FTC, KVK, EEI, MANAGE.
9.	**Mid Semester Examination**
10.	Community Radio, Agri Portal, Information Kiosk, Kisan Call Centre, Mobile phones, Expert System, VKC, DEMIC, ATMA, ATIC.
11.	Audio Visual Aids - Audio, Visual and Audio Visual, Advantages and Disadvantages.
12.	Participatory Extension – PRA Tools: Transect walk, Seasonal calendar, Venn Diagram, Resource mapping, Matrix ranking - SWOC Analysis.
13.	Rural Sociology – Definitions, Meaning, Rural vs Urban differences, Leader- Leadership – Definitions, Types of leader and Characteristics, Qualities of leader, Motivation - Definition, Functions of Motivation.
14.	Rural Institutions –Co-operatives, Voluntary organisation, NGO'S, Youth Club, SHG, FDG, FIG, CIG, FPO
15.	Extension System in India – CDP, NES, Panchayat Raj System
16.	Adoption-Definitions, Stages of Adoption - Adopter Categories and their Characteristics
17.	Consequences of Adoption – Social Change, Social Values and Social Distance

Practical Schedule

Ex.No.	Content to be taught
1	Preparation of Leaflets, Folders, Poster, Charts and Graphs.
2	Preparation of Flash cards, Pamphlets and Bulletins.
3	Handling of Public Address System.
4	Handling of LCD Projector and Power point Preparation.
5	Practicing Photographic Skills.
6	Organizing and conducting Method and Result Demonstration.
7	Organizing and conducting Campaign.
8	Visit to office of Joint Director of Agriculture / ADA / ADH / DDM / to know the Organizational structure and currently operated State and Central Government Schemes.
9	**Mid-Semester Practical Examination**
10	Guest Lecture/Visit to All India Radio and Printing Press to understand the functions.
11	Script writing for Radio and Newspaper.
12	Visit to Krishi Vigyan Kendra to study its functions.
13	Preparation of Interview / Survey Schedule for primary data collection.
14	Practicing SWOC Analysis.
15	Practicing PRA Techniques.
16	Visit to villages to study the adoption pattern of any one of the new technologies.
17	**Final Practical Examination**

Course Outcome

This course will facilitate the students to become a successful extension worker at grass-root level.

References / Text Books

Ray, G.L. 2006. Extension Communication and Management Naya Prakashan, Kolkata.

P.M.Khan, and L.L. Somani.2012. Fundamentals of Extension Education. Agrotech Publishing Acadamy. Udaipur.

S.V. Supe, 2011. Integrated Extension Education, Agrotech Publishing Acadamy. Udaipur.

Santha Givind, G.Tamilselvi and Meenambigai, 2011. Extension Education and Rural Development,Agrobios(India).

www.agritech.tnau.ac.in

AEX D22	Study Tour	(0+1)

Practical

The students will visit various National and State Level Institutions related to Agriculture, Horticulture, Forestry and other allied fields, major agro-based industries, commercial farms and research stations in various agro-climatic regions of the state. The students will gain first-hand knowledge about different agro climatic zones, crops grown, cultivation practice, socio-cultural and economic setting of the farming communities. The duration of the tour will be 7 days inclusive of days of start and return. Students will maintain a tour diary to record their observations at the places of visit. A tour record has to be submitted after the tour and the written test will be conducted at the end of the semester by Internal Evaluation.

Commercial Agriculture Courses (CAG D21/CAG D22)

1. Commercial production of bio-control agents (0+2)
2. Commercial production of spawn and mushroom (0+2)
3. Nursery technology (0+2)
4. Hybrid seed production (0+2)
5. Organic inputs and composting (0+2)
6. Broiler production (0+2)
7. Micro irrigation systems – installation, operation and maintenance (0+2)
8. Commercial floriculture and ornamental gardening (0+2)
9. Biofertilizer production (0+2)
10. Commercial Bee keeping (0+2)
11. Production of commercial Plant Tissue Culture Crops (0+2)
12. Integrated Farming System (0+2)

CAG D21/CAG D22 COMMERCIAL AGRICULTURE

1. Commercial Production of Bio-Control Agents (0+2)

Practical Syllabus

Introduction to Bio-control agents – Importance – History and development - Classical examples of bio-control agents – Role of biocontrol in pest and disease management – Categories of bio-control agents. Setting up a bio-control laboratory. Mass culture of tobacco caterpillar (*Spodoptera litura*) and gram pod borer (*Helicoverpa armigera*)- mass production of SlNPV and HaNPV. Mass production of *Trichogramma* spp., ***Acerophagus papapyae, Anagyrus lopezi, Bracon spp., Chelonus balckburni,*** *Chrsoperla*, *Cryptolaemus*, *Trichoderma viride,* and Entomo-pathogenic nematodes. Project preparation.

Practical schedule

Ex.No	Contents to be taught
1.	Bio-control – importance – history – successful bio-control programmes
2.	Role of bio-control agents in pest management. **Classical biological control**Basic facilities required for setting up a bio-control laboratory.
3.	Rearing host insects for pathogen production – facilities and materials required for rearing the insect on natural host and synthetic diet
4.	Acquiring mother culture of *Spodoptera litura* and *Helicoverpa armigera*. Conditioning for egg laying
5.	Collection of eggs – disinfecting eggs- preparation for hatching
6.	Synthetic diet preparation for host insects
7.	Releasing hatched out larvae in synthetic diet or natural hosts
8.	Maintaining the culture – sanitation and cleanliness of rearing unit
9.	Harvesting pupae and preparation of adult emergence cage
10.	Preparation for mating cages – Releasing adults with oviposition substrate. Collection of eggs
11.	Acquiring nucleus NPV inoculum – inoculation of NPV in natural host plant/ synthetic diet
12.	Culturing the virus-inoculated larvae. Harvesting virosed larvae
13.	Preparation of virus suspension for field application and maintaining nucleus virus culture
14.	Mass culturing of *Corcyra cephalonica* preparation of sorghum/ cumbu grain trays for feeding the caterpillars. Releasing eggs in the grains in sulphur treated broken grains
15.	Preparation of mating cages. Sanitation of rearing unit. Control of parasitoids Collection of adults, releasing in mating cages and collection of eggs.
16.	Separation of eggs- cleaning- sterilization – preparation of egg cards.

	Acquiring nucleus culture of *Trichogramma* spp. Mass culturing of ***Acerophagus papapyae, Anagyrus lopezi, Bracon spp.,*** **and** ***Chelonus balckburni*** **- Field release.**
17.	**Mid semester examination**
18.	Parasitizing the egg cards with nucleus culture. Sanitation of culture room. Collection of parasitized egg cards – Field release.
19.	Mass rearing of predatory coccinellid and ***Chrysoperla***. Field collection of coccinellids – preparation of prey insect – field collection of mealy bugs and culturing on pumpkin
20.	Insect cages for rearing -release of coccinellids on mealy bugs and culturing the predator
21.	Harvesting beetles- field release. Maintaining the mother culture for further culturing. **Field release of *Chrysoperla*.**
22.	Introduction to bio-control agents diseases – Importance – History and development,
23.	Categories of biocontrol agents - classical examples of bio-control agents – Role in plant disease management - Advantages of biocontrol agents – Characteristics of ideal biocontrol agents
24.	Mechanisms of biocontrol agents – mode of action – Parasitism –lysis – Antibiosis –competition
25.	Bio-control agents for plant pathogens-*Trichoderma viride* and *Bacillus sp.*. Laboratory requirement – materials required
26.	Acquiring *Trichoderma* culture – aseptic condition for a maintaining pure culture – media preparation
27.	Inoculation of nucleus culture in the media. Culture room sanitation and conditioning. Observation on growth characteristics
28.	Harvesting the culture- preparation for field application – formulation – field application
29.	*Bacillus sp.* Acquiring culture- media preparation – inoculation
30.	Laboratory sanitation and maintenance of culture. Observation on growth characteristics
31.	Harvesting the culture- preparation for field application – formulation – field application
32.	Packing the formulations of *Trichoderma viride* and *Bacillus sp.*. Storage for field use
33.	Cost analysis - Project preparation for setting a commercial laboratory
34.	**Final practical examination**

2. Commercial Production of Spawn and Mushroom (0+2)

Practical Syllabus

Mushroom - Introduction, importance-present production and trade, scope for export, markets for mushroom and mushroom products - Equipments required for culture media-. Spawn preparation-Oyster mushroom- mother spawn preparation - Oyster mushroom- second generation bed spawn preparation -Visit to oyster mushroom farm - Milky mushroom: mother spawn preparation- Milky mushroom – Maintenance of beds- Milky mushroom – pest- disease- Visit to Milky mushroom farm- Recipe and value added products from oyster and milky mushroom- Biodegradation of agro wastes using mushroom spawn- Mushroom as a component in Integrated Farming System - Project preparation on oyster-mushroom production and economics- Project preparation on milky mushroom and spawn production and economics.

Practical schedule

Ex.No.	Contents to be taught
1.	Analysis of world production, current scenario and future trends of edible and medicinal mushroom industry in India
2.	Different types of mushrooms and their morphology, Studying the general characters of mushrooms, Identification of edible and poisonous mushrooms
3.	Morphological characters of *Pleurotus ,Agaricus, Volvariella and Calocybe*
4.	Equipments required for culture media preparation, tissue culture, spawn preparation and substrate sterilization - their operation
5.	Preparation of different types of culture media- Potato Dextrose Agar (PDA) , Oats meal agar (OMA), Malt extract Agar medium (MEA)
6.	Spawn preparation- Laboratory requirements, essentials required for mother spawn and bed spawn preparation and their usage.
7.	Oyster mushroom: mother spawn preparation – Cooking of cholam grains, packing in polybags, autoclaving and inoculation
8.	Oyster mushroom: First generation bed spawn preparation - Cooking of cholam packing in polybags, autoclaving and inoculation
9.	Observing the spawn contaminants.
10.	Oyster mushroom: Second generation bed spawn preparation – Cooking of sorghum, packing in polybags, autoclaving and inoculation. Management of contaminants in mother spawn and bed spawn
11.	Oyster mushroom cultivation – essentials required , cropping room requirement
12.	Oyster mushroom : preparation of substrates for bed preparation
13.	Oyster mushroom – Bed preparation, Maintenance of beds, harvest and storage
14.	Oyster mushroom – pest, disease and their management

15.	Visit to oyster mushroom farm (spawn lab and mushroom farm)
16.	Visit to ulavar sandai markets (Farmers' Market) and observing the marketing pattern of oyster mushroom
17.	**Mid semester examination**
18.	Milky mushroom: mother spawn preparation – cooking of sorghum grains, packing in polybags, autoclaving and inoculation
19.	Milky mushroom: first generation bed spawn preparation – cooking of sorghum, packing in polybags, autoclaving and inoculation.
20.	Observing the spawn contaminants and their management
21.	Milky mushroom cultivation – essentials required, cropping room requirement, substrate for bed preparation.
22.	Milky mushroom - preparation of casing soil and application to mushroom bed
23.	Milky mushroom – Maintenance of beds, harvest, grading, packaging and post harvest storage
24.	Milky mushroom – pest, disease and their management
25.	Abiotic disorders of oyster and milky mushroom
26.	Visit to Milky mushroom farm (spawn lab and mushroom farm)
27.	Visit to ulavar sandai, markets and observing the marketing pattern of milky mushroom
28.	Recipe and value added products from oyster and milky mushroom
29.	Biodegradation of agro wastes using mushroom spawn
30.	Mushroom as a component in Integrated Farming System
31.	Project preparation on oyster- mushroom production and economics
32.	Project preparation on milky mushroom and spawn production and economics
33.	Working out various business models – Exposure to ABI (Agribusiness Business Incubator) and hand holding services
34.	**Final Practical examination**

Outcome

Learning production technology of mushroom cultivation will develop entrepreneurship abilities among the students

References

1.Sharma.B.C. 2005. Mushroom cultivation and uses.
2. J.N. Kapoor.2016. Mushroom cultivation.

3. Nursery Technology (0+2)

Objective

To understand and practice all the methods of propagation of fruit, flower and ornamental crops

Practical syllabus

Selection of nursery area – Preparation of seeds and seed treatment – Protray nursery raising of vegetable crops - Sowing and raising of rootstocks (Fruits and Flower Crops) – Application of Liquid Manure and plant protection of rootstock – Potting materials and Preparation of pot mixture – Potting of Rootstock and Hardening- Care and maintenance of scion mother block – Selection of Scion Plants and Grafting, Aftercare of Grafted Plants, Graft Separation and Hardening – Preparation of Cuttings of Ornamental Plants, Treating the Cuttings with growth regulators and Planting in Mist Chamber in Beds/Polybags, Potting of Rooted Cuttings and Hardening – Air Layering of Ornamental/Fruit Crops – Budding of Ornamental Plants (Rose) – Maintenance of Potted Plants – Packing and Marketing – Cost Analysis.

Practical Schedule

Ex.No	Contents to be taught/ Dealt
1	Selection of Nursery Area
2	Media for propagation of nursery plants and pot mixture preparation
3	Containers, tools and implements for propagation of horticultural crops
4&5	Preparation of seed bed, seed dormancy breaking, seed treatment fungicide, insecticide, bio fertilizer and bio control agents) and seedling raising.
6	Raising of portray nursery for vegetables and flower crops
7	Role of mist chamber and shade net in propagation of horticultural crops
8	Role of growth regulators in propagation of horticultural crops
9	Establishment of mother block (Fruits, Vegetables, flowers and ornamental plants)
10	Care and maintenance of mother block
11&12	Preparation of cuttings, rooting of cuttings and hardening of rooted cuttings
13	Potting, depotting, repotting and maintenance of rooted cuttings
14	Layering techniques in horticultural crops
15	Practicing ground layering in horticultural crops
16.	Practicing air layering in horticultural crops

17.	**Mid semester Examination**
18.	Selection of rootstock and scion for grafting and budding
19&20	Grafting techniques in horticultural crops
21&22	Practicing grafting in horticultural crops
23&24	Budding techniques in horticultural crops
25&26	Practicing budding in horticultural crops
27.	Special propagation methods in horticultural crops
28.	Practising Special propagation methods in horticultural crops
29.	Maintenance of nursery plants
30.	Packaging and marketing of nursery plants
31.	Cost analysis for nursery seedling production
32.	Visit to commercial ornamental nursery
33.	Visit to commercial seedling production unit
34.	**Final Practical Examination**

Outcome

The students will be familiarized with all propagation methods of fruit, flower and ornamental crops and to establish and manage the nursery

References/ Text books

N Kumar 2010, Introduction to Horticulture, Oxford & IBH Publishing Co Pvt. Ltd., New Delhi, India.

4. Hybrid Seed Production (0+2)

Practical Syllabus

Introduction to hybrid seed production, importance, merits and demerits-Types of hybrids-intraspecific-interspecific-single cross-double cross-Seed quality-genetic purity-physical purity-physiological quality-Factors responsible for genetic deterioration of varieties-Seed crop isolation-types of isolation-factors influencing isolation distance-Tools employed in hybrid seed production-CMS-GMS-CGMS-CHA-manual modifications-Multiplication of parental lines-procedures-Identification of varietal characters - genetic contaminants and practicing rouging-Designing of planting ratio-border rows and live markers-Practicing synchronization techniques - staggered sowing-Practicing supplementary pollination in hybrid seed production-Hybrid seed production in Rice, Maize Sorghum Pearl millet Red gram Castor Sunflower Cotton Tomato, Brinjal, Chillies, Bhendi, Cucurbits, Cole crops, Coconut, Papaya-Harvesting methods - Physical and chemical indices-Seed extraction techniques-Seed processing – Use of cleaner cum grader-Seed treatment – Seed packaging-Seed storage –Godown maintenance-Seed Certification procedure and practicing field count-Visit to hybrid seed production plots and seed processing unit-Economics of hybrid seed production.

Practical schedule

Ex.No.	Contents to be taught
1.	Introduction to hybrid seed production, importance, merits and demerits
2.	Types of hybrids-intraspecific-interspecific-single cross-double cross
3.	Seed quality-genetic purity-physical purity-physiological quality
4.	Factors responsible for genetic deterioration of varieties
5.	Seed crop isolation-types of isolation-factors influencing isolation distance
6.	Tools employed in hybrid seed production-CMS-GMS-CGMS-CHA-manual modifications
7.	Multiplication of parental lines-procedures
8.	Identification of varietal characters - genetic contaminants and practising rouging
9.	Designing of planting ratio-border rows and live markers
10.	Practising synchronisation techniques - staggered sowing
11.	Practising supplementary pollination
12.	Hybrid seed production in Rice
13.	Hybrid seed production in Maize
14.	Hybrid seed production in Sorghum
15.	Hybrid seed production in Pearl millet
16.	Hybrid seed production in Red gram

17.	**Mid Semester Examination**
18.	Hybrid seed production in Castor
19.	Hybrid seed production in Sunflower
20.	Hybrid seed production in Cotton
21.	Hybrid seed production in Tomato, Brinjal, Chillies and Bhendi
22.	Hybrid seed production in Cucurbits
23.	Hybrid seed production in Cole crops
24.	Hybrid seed production in Coconut and Papaya
25.	Harvesting methods - Physical and chemical indices
26.	Seed extraction techniques
27.	Seed processing – processing equipments
28.	Seed treatment – Seed packaging
29.	Seed storage –Godown maintenance
30.	Seed Certification procedure and practicing field count
31.	Visit to hybrid seed production plots
32.	Visit to seed processing unit
33.	Economics of hybrid seed production
34.	**Final Practical Examination**

References

1. Singh,B.D. 2005. Plant Breeding Principles and Methods. Kalyani Publishers, New Delhi.
2. Agrawal, R.L. 1996. Seed Technology, Oxford & IBH Publishing Co., New Delhi.
3. Bhaskaran, M. *et al.,* 2004. Principles of seed production. Scientific Publishers, Ludhiana.
4. Umarani, R., R. Jerlin., N. Natarajan., P. Masilamani and A.S. Ponnuswamy. 2006. Experimental Seed Science and Technology. Agrobios (India), Jodhpur.
5. Chopra V.L.2001.Breeding Field Crops. Oxford Publications.

5. Organic Inputs and Composting (0+2)

Practical Syllabus

Agricultural, Industrial and Urban wastes - Nutrient potential of different organic manures - Preparation of FYM Compost - Composting methods - Preparation of enriched FYM - Coir pith composting - Sugarcane trash - Press mud - Farm wastes and farm weeds - Parthenium composting - Determination of maturity indices of composts - Commercial utility of organic manures - Visit to compost yard. Introduction to vermicompost - Types of Vermicompost - Materials for vermicomposting. Preliminary treatment of composting material - Small Scale vermicomposting - Large scale vermicomposting - Other types of vermicomposting - Requirements for vermicomposting - Bedding materials, container, pH, Moisture content, Temperature - Cover feed substrates - Selection of right type of worm species - Preparation of vermicompost beds - Collection of vermicastings, vermiwash and storage - Vermicompost efficiency - Benefit Cost Analysis Application of vermicompost - Visit to Vermicompost unit.

Practical schedule

Ex.No	Contents to be taught
1.	Agricultural, Industrial and Urban wastes and their nutrient potential
2.	Composting process - Aerobic and anaerobic processes
3.	Composting methods, factors affecting composting, preparation of FYM Compost
4.	Collection of organic crop residues and weed biomass
5.	Collection of tree prunings, litter, urban waste, *etc*.
6.	Cutting of residues with shredding machine
7.	Preparation of phosphorus enriched FYM, zinc enriched FYM
8.	Preparation of coir pith compost
9.	Preparation of sugarcane trash compost
10.	Preparation of press mud Compost
11.	Composting of farm wastes and farm weeds (Parthenium compost)
12.	Temperature monitoring and turning of compost bed and determination of maturity indices of compost
13.	Conventional *EM* solution preparation for composting
14.	Visit to large scale compost production unit
15.	Introduction to vermicompost - Relative merits
16.	Types of vermicomposting
17.	**Mid semester Examination**
18.	Requirements for vermicomposting
19.	Bedding materials, Container, pH, Moisture content, temperature

	specifications
20.	Materials for vermicomposting
21.	Preliminary treatment of composting material
22.	Selection of earthworm *species* for vermicomposting
23.	Small scale vermicomposting
24.	Large scale vermicomposting
25.	Preparation of vermicompost – Spreading of bedding materials
26.	Preparation of vermicompost – Introduction of live worms
27.	Preparation of vermicompost – Moisture management
28.	Collection of vermi castings and storage
29.	Collection of vermiwash
30.	Sieving and bagging of vermicompost
31.	Field application of vermicompost and observation of crop response
32.	Cost and Benefit Analysis
33.	Visit to commercial vermicompost units
34.	**Final Practical Examination**

6. Broiler Production (0+2)

Practical Syllabus

Preparation of poultry house for receiving new arrivals – Disinfection – Sanitation procedures – Arrangement of Brooders, brooding, spreading of litter and medication – Medication schedule and vaccination - broiler chicks – Measures to control respiratory problems. Coccidiosis and their management problems – Feeding, watering, spacing – Management of litter – Use of growth promoters and feed additives – Improvement of feed intake and feed conversion efficiency – Composition of broiler feeds, feeding ages and consumption levels – Commonly used ingredients in feed mixing for broilers – Least cost feed formulation – Observation on feed consumption, use of stimulants – Recording of body weight of broilers during growth - Management of broilers during summer – winter – Examination of internal organs of poultry – Common basic post mortem findings to know the cause of death – Dressing procedures to prepare ready to cook broilers – Various poultry meat preparations – Maintenance of records – Marketing of broilers – Cost analysis – Economics of broiler farming..

Practical Schedule

1.	Preparation of poultry house for receiving new arrivals
2.	Poultry house and disinfection
3.	Poultry house and Sanitation procedures
4.	Arrangement of Brooders, brooding
5.	Spreading of litter and medication
6.	Medication schedule to be followed
7.	Vaccination schedule Breeding techniques in for broiler chicks
8.	Measures to be adopted to control respiratory problems
9.	Coccidiosis and their management problems
10.	Feeding and watering
11.	Spacing and management of litter
12.	Use of growth promoters and feed additives
13.	Assessment of feed intake
14.	Periodical improvement of feed conversion efficiency
15.	Composition of broiler starter feeds, feed consumption for 0-4 weeks of age
16.	Composition of broiler finisher feeds, feed consumption for 5-8 weeks of age
17.	**Mid-semester examination**
18.	Commonly used ingredients in feed mixing for broilers
19.	Least cost feed formulation
20.	Observation and study of feed consumption
21.	Role, importance and use of feed additives and growth promotors
22.	Week-wise recording body weight of broilers 0-4 weeks
23.	Week-wise recording body weight of broilers 5-8 weeks
24.	Management of broilers during summer

25.	Management of broilers during winter
26.	Common basic post mortem findings to know the cause of death
27.	Examination of internal organs of poultry
28.	Mortality rate and morbidity rate assessment
29.	Dressing procedures to prepare ready to cook broilers
30.	Preparation of various poultry meat products
31.	Maintenance of records and marketing of broilers
32.	Cost analysis
33.	Economics of broiler farming
34.	**Final practical examination**

7. Micro Irrigation Systems –Installation, Operation and Maintenance (0+2)

Practical syllabus

Surveying – area computation – Methods to measure soil moisture – irrigation water measurements – irrigation scheduling - Irrigation efficiencies and its types - Quality of soil and water - method of irrigation systems - Drip irrigation system – components, design and installation – Filters and its types – Fertigation and equipments used for fertigation - Uniformity of emitter - Emitter clogging – Chlorination - Water soluble fertilizers - Sprinkler irrigation system – components, design and installation - Study of Wetting patterns and uniformity in sprinklers - Chemigation and pestigation– principles and methods - Pumps, principles and types of pumps - Evaluation and selection of pumps - Automation of micro irrigation - Visit to Micro irrigation installed fields.

Practical schedule

Ex.No	Content to be taught
1	Surveying – hectare, acre, square metre, square feet conversions- computation of agricultural field area
2	Methods to Measure Soil Moisture – Gravimetric direct method, Tensiometer, Neutron Probe.
3	Irrigation water measurements – volume - area method & float method – field practices
4	Irrigation water measurements – weirs (rectangular, trapezoidal) & flumes
5	Irrigation scheduling IW/CPE ratio, depth of irrigation, irrigation frequency, irrigation interval – simple calculations.
6	Irrigation efficiencies – types – conveyance efficiency, application efficiency, storage efficiency, distribution efficiency and water use efficiency – simple problems.
7	Quality of soil and water for micro irrigation
8	Method of irrigation systems – surface irrigation methods – ridges and furrow, check basin, border irrigation, beds and channel irrigation, flooding irrigation.
9	Surge irrigation system - Subsurface irrigation system – underground pipe irrigation system
10	Drip irrigation system - components
11	Design of drip irrigation system
12	Installation of drip irrigation system
13	Filters- types – sand filter, disc filter, hydro-cyclone filter, screen filter – maintenance
14	Fertigation – equipments – Venturi, fertigation tank, fertigation pump - advantages and disadvantages

15	Uniformity and wetting pattern of emitter
16	Emitter clogging - causes and remedies
17	**Mid Semester Examination**
18	Chlorination
19	Water soluble fertilizers – types - uses
20	Sprinkler irrigation system – components
21	Design of sprinkler irrigation system
22	Installation of sprinkler irrigation system
23	Study of Wetting patterns in sprinklers
24	Study of Uniformity for sprinklers
25	Chemigation – principles and methods
26	Pestigation – principles and methods
27	Pumps, types of pumps –Basic components and basic working principle of Centrifugal pump
28	Basic components and basic working principle of submersible pump
29	Basic components and basic working principle of turbine pump
30	Evaluation and Selection of pumps
31	Automation of micro irrigation – components
32	Types of controls and automation in Micro Irrigation
33	Visit to Micro irrigation installed fields
34	**Final practical examination**

8. Commercial Floriculture and Ornamental Gardening (0+2)

Objective

To learn and practice the cultivation techniques of commercial crops and the art of ornamental gardening

Practical Syllabus

Study on cultural requirements of commercial flower crops – Jasmine, Rose (loose flower), Chrysanthemum, Marigold, Tuberose, Crossandra, Cockscomb, nerium, gomphrena, ixora and hibiscus. Seed production in annual flower crops marigold, cockscomb & gomphrena- Ornamental gardening – Formal and informal gardens – Components of garden – lawn and lawn making – study of important flowering annuals, herbaceous perennials, flowering and foliage shrubs – flowering and foliage trees – bulbous plants and hedge plants - creepers and climbers –cacti and succulents – Indoor Plants– Cut Flowers – Green house establishment and maintenance – Flower arrangement – Bonsai culture, dry flower making, Extraction methods of concrete from flowers.

Preparing ornamental garden design for home – Preparation of pot mixture – potting and repotting practices in raising nursery for ornamental plants–visit to commercial flower fields, green house units of major cut flowers, botanical gardens, Concrete extraction units.

Practical schedule

Ex. No.	Contents to be taught/Dealt
1.	Study on cultural practices in jasmine
2.	Study on cultural practices in rose(loose flower)
3.	Study on cultural practices in chrysanthemum and marigold
4.	Study on cultural practices in tuberose
5.	Study on cultural practices in crossandra and cockscomb
6.	Study on cultural practices in nerium and gomphrena, ixora and hibiscus
7.	Seed production in annual flower crops marigold, cockscomb and gomphrena
8.	Study on garden types – formal and informal gardens
9.	Study on components of a garden
10.	Lawn and lawn making
11.	Identification of important flowering annuals and herbaceous perennials
12.	Identification of important flowering and foliage shrubs
13.	Identification of important flowering trees
14.	Identification of important foliage trees
15.	Identification of bulbous and hedge plants
16.	Identification of creepers and climbers

17.	**Mid-Semester Examination**
18.	Identification of cacti and succulents
19.	Study on indoor plants and its utility
20.	Practices in flower arrangement with cut flowers
21.	Green house establishment and maintenance
22.	Flower arrangement
23.	Study on bonsai culture
24.	Study on dry flower making
25.	Extraction methods of concrete from flowers
26.	Preparing garden design for ornamental home garden
27.	Practices in preparation of pot mixture for ornamental plant growing
28.	Practices in potting and repotting of ornamental plants
29.	Practices in raising nursery for ornamental plants
30.	Visit to commercial flower fields
31.	Visit to green house units of major cut flowers
32.	Visit to botanical garden
33.	Visit to Concrete extraction units.
34.	**Final practical examination**

Course outcome

The students will be familiarized with production technologies in commercial flower crops and gardening aspects.

References/ Text books

1. www.tnau.ac.in
2. Randhava, G.S., and A Mukhopadhyay, 1998 Floriculture in India, Allied Publishers Limited. New Delhi
3. Desh Raj, 2013, Floriculture at glance. Kalyani Publishers, New Delhi

9. Biofertilizer Production (0+2)

Objective

This course is designed to provide knowledge about the role of microorganisms as biofertilizers. This course is framed to provide hands on training to the students on the isolation, purification, screening, mass production of bacterial, fungal, and algal biofertilizers. It also narrates about the dosage and method of application.

Practical syllabus

Microorganisms for crop nutrition – biofertilizers - types of biofertilizers - production and demand in India; Importance and contribution of biofertilizers in Agriculture and allied sectors. Sources of good quality strains for biofertilizer production.

Facilities and equipments required for laboratory scale and industrial scale production of biofertilizers. Raw materials required – glass wares, chemicals etc and types of carrier material and its specifications. Production of various bacterial biofertilizers in laboratory scale and large scale - *Rhizobium, Azospirillum,Azotobacter, Glucanoacetobacter diazotrophicus,* phosphate solublisers, potash releasing microorganisms and PGPR. Selection and mass production of Azolla, Blue Green Algae, PPFM and AM fungi. Shelf life and storage of carrier and liquid based biofertilizers. Constraints in mass production of various biofertilizers. Storage and preservation of various microbial cultures.

Quality standards for different commercial biofertilizers - *Rhizobium, Azospirillum,Azotobacter, Glucanoacetobacter diazotrophicus,* phosphate solublisers, potash releasers,PGPR , Azolla, Blue Green Algae, AM fungi and PPFM. Quality control laboratories in India.

Production of carrier based and liquid inoculants. Application technologies – form, dose, method and time of application of biofertilisers - *Rhizobium, Azospirillum,Azotobacter, Glucanoacetobacter diazotrophicus,* phosphate solublisers, potash releasing, PGPR, Azolla, BGA, AM fungi and PPFM - Evaluation of plant response to biofertilizer application (Nodulation, earliness of germination, plant vigor and biometric observation including root development). Newer formulations of biofertilizers.

Calculation of commercial production cost – fixed - cost of building, equipments and glass wares and variable cost - raw materials, maintenance, labour cost etc. Formulation of a project for production of fixed quantum of various biofertilizers per annum. Economics of biofertilizer usage - B:C ratio.

Practical Schedule

Ex.No	Contents to be taught
1.	Biofertilizers – types and importance of biofertilizers
2.	Facilities and equipments required for laboratory scale and large scale production
3.	Isolation, purification of agriculturally important microorganisms
4.	Screening of efficient biofertilizer cultures
5.	Production of various bacterial biofertilizers in laboratory scale - *Rhizobium, Azospirillum* and *Azotobacter*
6.	Production of various bacterial biofertilizers in large scale *Rhizobium, Azospirillum* and *Azotobacter*
7.	Production of various bacterial biofertilizers in laboratory scale- *Glucanoacetobacter diazotrophicus,* phosphate, solublisers, zinc solublisers, potash releasers and PGPR
8.	Production of various bacterial biofertilizers in large scale - *Glucanoacetobacter diazotrophicus,* phosphate, solublisers,zinc solublisers, potash releasers and PGPR
9.	Mass production of Azolla in nursery and main field
10.	Mass Production of Blue Green Algae – Development of BGA flakes
11.	Mass production of PPFM
12.	Mass production of AM fungi
13.	Liquid biofertilizer production
14.	Newer formulations of biofertilizers
15.	Enhancing the shelf life through preservatives and storage of biofertilizers-induction of sporulation
16.	Storage and preservation of various microbial cultures
17.	**Mid semester Examination**
18.	Problems and Constraints in mass production of various biofertilizers
19.	Quality control - BIS /FCO standards for *Rhizobium ,Azospirillum, Azotobacter a*nd *Gluconoacetobacter.*
20.	Quality control- BIS /FCO standards for phosphate solublizers, potash releasers and AM fungi
21.	Visit to biofertilizer production unit
22.	Application techniques– form, dose method and time of application of biofertilisers – *Rhizobium, Azospirillum,Azotobacter, Glucanoacetobacter diazotrophicus,* phosphate solublisers and potash releasers .
23.	Application techniques– form, dose method and time of application of biofertilisers Azolla, BGA, AM fungi, PPFM and PGPR
24 -25	Evaluation of plant response to various biofertilizer application- Rhizobium, Azospirillum, Azotobacter
26 -27	Evaluation of plant response to various biofertilizer application- phosphorus solubilizer, potash releaser

28 -29	Evaluation of plant response to various biofertilizer application Azolla, BGA, AM fungi, PPFM and PGPR.
30.	Visit to biofertilizer inoculated field – Farmers field and interaction with farmers
31.	Requirements for establishment of biofetilizer production unit- Economics
32.	Economics of biofertilizer usage - B:C ratio
33.	Project preparation for biofertilizer production
34.	**Final Practical Examination**

Outcome

This course will provide knowledge about the role of microorganisms as biofertilizers. The students will acquire hands on training on the mass production of bacterial, fungal, and algal biofertilizers.

References

1. Subba Rao, N.S (2006) Soil Microbiology (4th Edition of Soil Microbiology and Plant Growth). Oxford & IBH, New Delhi
2. Rai, M.K (2006) *Handbook of Microbial Biofertilizers*. Food Products Press. New York.
3. Trivedi, P.C (2008) Biofertilizers. Pointer Publications, New Delhi.
4. Vendhan, R.T (2008)Techniques in Agricultural Microbiology.Agrobios (India)

10. Commercial Bee keeping (0+2)

Practical Syllabus

Introduction; History of bee keeping; Importance of bee keeping; Identification of bee species and castes; Distinguishing features of hive bees and wild bees; Structural adaptations in honey bees; Biology of honey bee castes; Social organization of honey bee colonies; Communication in bees; Bee behavior; Foraging ecology of honey bees; Identification of pasture of honey bee - Preparation of floral calendar; Location and Establishment of an apiary; Growing of pastural plants in and around apiary; Bee keeping Appliances; Beginning of bee keeping; Hiving of Indian bee feral colonies; Methods of hive inspection; Apiary management practices-management of honey bee during honey flow season – swarm control, Dividing, Supering honey extraction and processing, etc., – Management of honey bees during loan season – sugar solution feeding, pollen supplement, uniting, etc., Identification and management of bee enemies; Diagnosis and management of honey bee diseases; Management of honey bees for honey Production; Management of honey bees for crop pollination; Protection of bee colonies from pesticides and adverse climatic condition; meliponiculture – Hiving of stingless bee colonies using different hives; Bee products – honey, bees wax, bee pollen, propolis, bee venom and royal jelly – Testing the purity of honey.

Practical Schedule

Ex. No.	Contents to be taught
1	Introduction and History of bee keeping
2	Importance of bee keeping
3	Identification of bee species and castes
4	Distinguishing features of hive bees
5	Distinguishing features of wild bees
6	Structural adaptations in honey bees
7	Bio ecology of honey bees
8	Social organization and communication in honey bees
9	Bee behavior
10	Foraging ecology of honey bees and Identification of pasture of honey bees
11	Identification of pasture of honey bees (contd.) and preparation of floral calender
12	Location and establishment of an Apiary
13	Growing of pastural plants in and around apiary
14	Bee keeping appliances and their uses
15	Hiving of Indian bee feral colonies – Practicing
16	Setting of Indian bee colonies- Practicing
17	**Mid semester examination**
18	Meliponiculture – Hiving of stingless bees using different lives

19	Methods of hive inspection – Practicing
20	Apiary management during honey flow season – Practicing Swarm control
21	Apiary management during honey flow season – Practicing Dividing
22	Apiary management during honey flow season – Practicing Supering
23	Apiary management during honey flow season – Practicing Honey extraction
24	Apiary management during lean season – Practicing Sugar solution
25	Apiary management during lean season – Practicing Pollen supplement feeding
26	Apiary management during lean season – Practicing Uniting
27	Identification and management of bee enemies
28	Dignosis and management of bee diseases
29	Management of honey bees for honey production and crop pollination
30	Protection of bee colonies from pesticides and during adverse climatic conditions
31	Bee Products – Honey, bees wax, pollen, propolis, bee venom and royal jelly – Testing of purity of honey
32	Visit to commercial Apiaries
33	Project preparation
34	**Final Practical Exam**

Outcome

This course will provide clear knowledge on bee keeping and its commercial advantages. The students will acquire hands on training on the maintenance of bee colonies, honey extraction, management of bee enemies and diseases and utilization of honey bees for pollination and honey production.

11. Production of commercial Plant Tissue Culture Crops (0+2)

B. Objective: To acquire the practical knowledge of commercial micro propagation techniques of different crops.

C. Practical syllabus

Fundamentals of Plant Tissue Culture- Requirement, Operation and maintenance of equipments-Sterilization techniques and maintenance-Nutrient stocks-preparation and types of media and explants.Types of Solidifying agents, Antioxidants and supplements- Types of Regeneration-Hardening-Meristem tip culture-Anther culture-Protoplast fusion-Embryo rescue-Cell suspension culture.Tissue culture techniques in Rice, Maize , Cotton and Redgram.Micro propagation techniques in Banana, Sugarcane, Gerbra, Chrysanthemum, Orchids, Tapioca and Potato.Molecular pharming -Problems and solutions-Low cost plant tissue culture techniques.

Practical schedules

Ex.No.	Contents to be taught
1.	Fundamentals of Plant Tissue Culture; Totipotency- Hisotry of plant tissue culture- Advantages of tissue culture- Industrial applications of plant tissue culture.
2.	Fabrication of tissue culture lab: Room specification-false proof-temperature regulating system-lighting system- wind curtains- fire alarming- precautions.
3.	Requirement, Operation and maintenance of tissue culture equipment: Media table- Electronic balance- pH meter -stirrer- Hot air oven-Autoclave- glass vessels- laminar flow chamber and its components-Sterilizer- distilled water unit.
4.	Sterilization techniques and maintenance of asceptic conditions; type of sterilizing agents; sterilization of laminar flow chamber- sterilization of room- anti septics and anti biotics- preparation and usage.
5.	Preparation of nutrient stocks; Preparation of salt stocks for all the nutrients.
6.	Types of media; MS media-N6 media-B5 media- Preparation and utilization.
7.	Types of explants; vegetative and gametic explants; nodes, internodes, leaf, petiole, immature buds, immature and mature embryos-microspores- anthers- ovules.
8.	Visit to private tissue culture lab / nursery
9.	Preparation of media; steps in media preparation; pouring-solidification and arranging.
10.	Types of Solidifying agents, Antioxidants and supplements.

11.	Types of Regeneration- modes of plant regeneration-organogenesis-direct and indirect- somatic embryogenesis-steps in embryos formation- types.
12.	Hardening procedure for regenerated plantlets; rooting steps-maintenance in tissue culture lab- Green house- Shade net house-transport protocols.
13.	Meristem tip culture technique; excision of meristem- sterilization-inoculation- regeneration- advantages of meristem tip culture.
14.	Anther culture technique for production of haploid plants- microspore culture- anther culture- regeneration of haploid plants and hardening.
15.	Protoplast fusion technique; preparation of protoplasts- step wise protocol- PEG mediated- Electro fusion.
16.	Embryo rescue technique- step wise protocol- excision and inoculation-regeneration and hardening- Advantages.
17.	Cell suspension culture for production of metabolites- initiation of cell suspension- maintenance of suspension culture- harvest of biomass and extraction of metabolites
18.	**Mid semester Examination**
19.	Tissue culture techniques in Rice- Surface sterilization of seeds-initiation of callus from mature embryo- selection of embryogenic callus- regeneration of plantlets- rooting and hardening of plantlets.
20.	Tissue culture techniques in Maize- Surface sterilization of seeds - initiation of callus from mature embryo- selection of embryogenic callus- regeneration of plantlets- rooting and hardening of plantlets.
21.	Tissue culture techniques in Cotton- Surface sterilization of seeds - Induction of somatic embryogenesis from embryonic axis- maturation and regeneration of somatic embryos- rooting of plantlets- hardening of plantlets
22.	Tissue culture techniques in Redgram- Surface sterilization of seeds - Induction of somatic embryogenesis from mature embryos- maturation and regeneration of somatic embryos- Rooting of plantlets- Hardening of plantlets.
23.	Micro propagation techniques in Banana- surface sterilization of suckers-shoot tip culture- initiation of adventitious buds-multiplication of buds- elongation and rooting- Hardening procedures.
24.	Micro propagation techniques in Sugarcane- Surface sterilization of nodes- initiation of nodal culture- shoot tip culture- initiation of adventitious buds-multiplication of buds- elongation and rooting-Hardening procedures.
25.	Micro propagation techniques in Gerbra and Chrysanthemum- Surface sterilization of seeds- germination and preparation of axenic plants-shoot tip culture- initiation of adventitious buds- multiplication of buds-elongation and rooting- Hardening procedures.

26.	Micro propagation techniques in Orchids- Surface sterilization of flower stalk- initiation of protocorm like bodies (PLBs)- mass multiplication of PLBs- regeneration of PLBs- Rooting and hardening of plantlets.
27.	Micro propagation techniques in Tapioca- Surface sterilization of shoot tips- excision of meristem tip and inoculation into media- initiation of adventitious buds- multiplication of buds- elongation and rooting- hardening procedures- virus indexing for virus free plants.
28.	Micro propagation techniques in Potato- surface sterilization of tubers- initiation of axenic plants- excision of nodes- nodal culture- induction of adventitious buds- induction of micro tubers- Hardening procedures.
29.	Visit to farmer's field planted tissue culture crops
30.	Visit to commercial Plant tissue culture unit- learning practical aspects of commercial micro propagation.
31.	Problems and solutions in plant tissue culture- poor regeneration- contamination- Somaclonal variation- poor hardening
32.	Low cost Plant tissue culture techniques- Utilization of low input techniques- water unit- nutrient supplements- labour management.
33.	Project preparation to establishment of Plant tissue culture unit- Tissue culture unit model preparation for venturing start ups.
34.	**Final Practical Examination**.

D. Outcome:

Tissue culture generated plantlets are widely used in crops like banana, tapioca and ornamentals for improved yield, uniform maturity and protection against pests and diseases. Hence, training on micro propagation will be useful for entering into private and public firms for employment to the diploma graduates. The syllabus covers the practical aspects of micro propagation in major crops.

References

Sunilkumar and Singh MP (2009). Plant tissue culture - ABH Publishing.

Víctor M. Loyola-Vargas, C. De-la-Peña, R. M. Galaz-Ávalo, F. R. Quiroz-Figueroa (2008). Plant tissue culture – Springer Publications.

Edwin F. George, Michael A. Hall, Geert-Jan De Klerk (2008). Plant Propagation by tissue culture- Springer Publications.

12 Integrated Farming System (0+2)

Objective

This course is designed to provide practical knowledge about the Integrated farming systems.

Practical Syllabus

Farming Systems – IFS – Components - cropping system experiments in wetland, gardenland and dryland ecosystem - cropping scheme and working out input requirements for wetland, gardenland and dryland cropping system - Benefit assessment - Resource recycling - Animal component - Farm pond and fishes - Mushroom production – Sericulture – Apiary – Biogas – Agroforestry - Visit to IFS in wetland, Gardenland, Dryland - Formulation of IFS for wetland ecosystem, gardenland ecosystem, dryland ecosystem - Assessment of organic recycling in IFS - Study on indices for evaluating IFS - Preparation of bankable projects.

Practical schedule

Ex.No.	Title of the exercise
1.	Introduction to farming system – concepts and definitions.
2.	Acquiring knowledge on different farm components in farming system
3.	Acquiring knowledge on crop component - cropping system – cropping pattern – cropping scheme and crop plan.
4.	Acquiring knowledge on major cropping system of India and Tamil Nadu
5.	Visit to cropping system experiments in wetland, gardenland and dryland ecosystem.
6.	Preparation of cropping scheme and working out input requirements for wetland ecosystem system
7.	Preparing calendar of operation for wetland cropping system
8.	Preparation of cropping scheme and working out input requirements for gardenland ecosystem
9.	Indices to evaluate the advantages of cropping system
10.	Preparing calendar of operation for gardenland cropping system
11.	Preparation of cropping scheme and working out input requirements for dryland ecosystem system
12.	Preparing calendar of operation for dryland cropping system
13.	Farming system and Integrated Farming System
14.	Integration of subsystem in farming system
15.	Benefit assessment in Integrated Farming System
16.	Accessing risk and opportunities in farm components and their suitability in integrated farming system and
17.	**Mid Semester Practical Exam**
18.	Interaction between farm components in IFS and Resource recycling in Integrated Farming System
19.	Animal component in IFS and visit nearby animal husbandry unit
20.	Farm pond and fishes in IFS and visit nearby fish farming unit

21.	Mushroom production in IFS and visit nearby mushroom production unit
22.	Sericulture in IFS and visit nearby sericulture unit
23.	Apiary in IFS and visit nearby apiary unit
24.	Biogas unit in IFS and visit nearby biogas unit
25.	Agroforestry in IFS and visit nearby agroforestry unit
26.	Visit to IFS in wetland – observation on resource availability and allocation, recycling of inputs and economics
27.	Visit to IFS in garden land – observation on resource availability and allocation, recycling of inputs and economics
28.	Visit to IFS in dry land – observation on resource availability and allocation, recycling of inputs and economics
29.	Formulation of IFS for wetland ecosystem
30.	Formulation of IFS for gardenland ecosystem
31.	Formulation of IFS for dryland ecosystem
32.	Assessment of organic recycling in IFS
33.	Study on indices for evaluating IFS
34.	Preparation of bankable projects in IFS under different agro ecosystem

References

Ruthenburg, H. 1971. *Farming Systems in Tropics*. Clarendon Press, London.

S.P. Palaniyappan. 1984. Cropping system in the tropics: Principles and management. New age international publishers. New delhi.

Saroja Raman. 2006. *Agricultural Sustainability – Principles, Processes and Prospects*. Food Products Press, New York.

C.Jayanthi, P.Devasenapathy and G.Vennila. 2008. Farmimg system: Principles and practices. Sathish serial publishing house. Delhi.