

**Diploma in Agriculture  
Syllabus - 2020**

**I Semester**

<b>Sl.No.</b>	<b>Course No.</b>	<b>Course Title</b>	<b>Credit hours</b>
1.	AGR X 101	Principles of Agronomy and Agricultural Meteorology	1+1
2.	AGR X 102	Irrigation and Weed Management	1+1
3.	SAC X 101	Basics of Soil Science and Nutrient Management	1+2
4.	HOR A 101	Nursery Technology of Horticultural Crops	0+1
5.	ENG X 101	Agricultural Engineering practices	0+2
6.	COM X 101	English Language and Computer Applications*	0+1
7.	PED X 101	Physical Education **	0+1
		<b>Total Credits</b>	<b>3+9</b>

**\*Team teaching by Computer Science and English**

**\*\*Continued in the II Semester**

Note: PED X 101 course will be offered from first semester. Registration and evaluation will be done during second semester.

## AGR X101 Principles of Agronomy and Agricultural Meteorology 1+1

### 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 - Principles and practices of agricultural operations - Tillage - Intercultural Operations, Implements and tools in Agriculture - Cropping Systems - Principles - Merits and demerits - Agroforestry Systems -Seeds and Sowing - Seed treatment -Optimum plant population - Crop geometry - Nursery - Transplanting - After cultivation - Manures and fertilizers - Methods of application - Harvesting - Meteorology - Agricultural Meteorology -Weather parameters and their role in crop production - Precipitation- Weather aberrations- Drought- Agro Climatic Zones of Tamil Nadu

### 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. SankaraReddi. 2014. Principles of Agronomy.

Kalyani Publishers, New Delhi.

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

### Lecture schedule

Lec. No.	Content
1.	Agriculture - Definition - Scope of agriculture in India and Tamil Nadu
2.	Branches of Agriculture - Agronomy and Scope of Agronomy
3.	Agronomic Classification of Crops
4.	Principles and practices of agricultural operations - Tillage and tilth - Definition,

	types, objectives
5.	Cropping Systems - Principles and concepts - Merits and demerits
6.	Agroforestry Systems - Primary Systems -Agrisilviculture, Silvipasture, Agrisilvipasture- Mixed Wood Lots
7.	Seeds - Sowing - methods - Seed treatment - objectives and methods
8.	Optimum plant population - Crop geometry - types and factors affecting them
9.	Nursery - Transplanting - Gap filling and thinning
10.	After cultivation- Weeding and Hoeing, Earthing up, other special cultural operations.
11	Manures - Organic Manures, Green Manures, Fertilizers - Methods of application - Basal, Split and Foliar Application, Fertigation
12.	Harvesting - time and methods of harvesting, Threshing, Drying, Storage
13.	Meteorology - Agricultural Meteorology - Definition, importance and scope of agricultural meteorology for crop production
14.	Weather parameters -Precipitation, temperature, atmospheric humidity, solar radiation, wind velocity, atmospheric gases
15.	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
16.	Drought - Types and their effect on crop production - Management of drought
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 - Learning and acquiring skills in seed treatment - Practicing sowing and transplanting - 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.	Content
1.	Identification of crops -Wetland - Irrigated uplands - Dryland ecosystem
2.	Acquiring skill in operating the primary tillage implements - in Wetland, Irrigated Upland and Dryland Ecosystem
3.	Acquiring skill in operating the secondary tillage implements - in Wetland,

	Irrigated Upland and Dryland Ecosystem
4.	Acquiring skill in operating the special purpose implements - in Wetland, Irrigated Upland and Dryland Ecosystem
5.	Identification of seeds, green manures, organic manures
6.	Practicing seed treatment - sowing - broadcasting, dibbling, sowing behind the plough, drill sowing or drilling - Transplanting
7.	Practicing application of organic manures, green manures and green leaf manures
8.	Identification of inorganic fertilizers and practicing various method soil application of fertilizers - broadcasting, band placement, point placement, sub soil placement, Fertigation mud ball technique
9.	Practicing fertilizer requirement calculation and foliar application of fertilizers
10.	Measurement of growth and Yield components of Cereals, Pulses, oilseeds and Fibre crops
11.	Visit to agromet observatory and handling rain gauge and recording rainfall
12.	Handling of maximum, minimum, dry and wet bulb thermometers and recording of temperatures
13.	Study of wind vane, anemometers, open pan evaporimeter
14.	Computing mean of rainfall and temperatue data; standard week wise, month wise and season wise
15.	Gathering information on forecasts and understanding agro advisories
16.	Revision
17.	Final practical examination

## **AGR X 102 Irrigation and Weed Management1+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 field crops - Weed management practices for parasitic and problematic weeds

### **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**

- Michael, A.M. 1997. Irrigation: Theory and Practice Vikas Publishers  
Prihar, S.S. and B.S. Sandhu. 1987. Irrigation to field crops: Principles and Practices. ICAR Publication.

- Sankara Reddy, G.H. and T. Yellamanda Reddy. 1997. Efficient use of irrigation water. Kalyani Publishers
- JaganathanR., and R.Jayakumar. 2003. Weed Science Principles, Kalyani Publishers, New Delhi.
- Rao, V. S. 1983. Principles of Weed Science. Oxford and IBH Publishing Co. New Delhi.
- Subramanian, S. A. Mohammed Ali and R. Jayakumar. 1991. All about Weed Control. Kalyani Publishers, New Delhi.

### Lecture Schedule

Lec. No.	Contents
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 - methods to overcome plant water stress.
3.	Crop water requirement - components of 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 disadvantages.
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 -agronomic practices for use of poor quality water (saline, effluent and sewage water).
9.	Weeds - Definition, classification and characteristics, harmful and beneficial effect of weeds
10.	Classification and characteristics of weeds of different agro ecosystems-lowland , irrigated upland
11.	Classification and characteristics of weeds of different agro ecosystems- rainfed land and waste land weeds
12.	Classification and characteristics of weeds - Aquatic, parasitic and obnoxious weeds
13.	Principles and methods of weed management:Preventive, cultural, mechanical, chemical, biological and alternate methods

14.	Herbicides - merits and demerits of using herbicides –and method of application - herbicide formulations
15.	Integrated weed management practices for major field crops ( rice, maize, small millets), pulses (blackgram,greengram& redgram, oilseeds (groundnut& sunflower)and commercial crops (cotton and sugarcane)
16.	Weed management practices for parasitic weeds (Striga, Orobanche and Loranthus) and problematic weeds (Cynodon, Cyperus, Parthenium, Kattukandankathiri), 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.	Content
1.	Acquiring skill on measurement of irrigation water with flumes and weirs
2.	Acquiring skill on Land leveling and land shaping - Beds and channels - ridges and furrows, border strips - broad bed furrow method of irrigation- ring basin.
3.	Acquiring skill on Laboratory analysis of Irrigation and Industrial Effluent water quality.
4.	Layout, operation and maintenance of drip and sprinkler irrigation systems.
5.	Observation of irrigation structures in wetlands and irrigated upland and drylands in their institutes
6.	Visit to irrigation command area /projects
7.	Identification, classification and characterization of weeds of different eco-system
8.	Learning of traditional irrigation systems in the farmers field
9.	Practicing skill development on cultural and non-chemical weed management
10.	Identification of herbicides and their usage and method of application

	(crop,chemical name & dose, trade name & dose and time of application.)
11.	Practicing skill development on spray equipment's and spray fluid calibration
12.	Practicing skill development on herbicide application techniques
13.	Calculation of herbicide quantity and recommendation for different eco systems
14.	Practicing and acquiring skill on mechanical methods of weed control using different types of weeders in wetland and Irrigated upland ecosystem
15.	Practicing skill development on mechanical methods of weed control using different types of weeders in dryland ecosystem
16.	Revision
17.	Final practical examination

## **SAC X 101 Basics of Soil Science and Nutrient Management 1+2**

### **Objectives**

- To impart basic knowledge about soil, its physical and chemical properties
- To educate students about management of problem soils and poor quality water
- To impart knowledge on soil fertility and nutrient availability
- To understand the role of fertilizers and manures in nutrient supply to plants for better fertilizer use efficiency

### **Theory Syllabus**

Soil - composition - Soil physical properties - Colour, Texture, Structure, Bulk density, Pore space, Soil water, Soil air, Soil temperature. Soil chemical properties - Soil pH and EC. - 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 - Management aspects - Irrigation water quality - Management of poor quality water.

Plant nutrients - Primary, secondary and micronutrients - Manures and fertilizers - Nitrogenous, Phosphatic and Potassic fertilizers - Secondary and micronutrient fertilizers - Mixed fertilizers and water soluble fertilizers - Nutrient use efficiency - methods of fertilizer application - INM - Soil testing and fertilizer recommendations.

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

### **References**

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

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

John Havlin, James Beaten, Samuel Tisdale, Werner Nelson, 2005.

*Soil Fertility and Fertilizers - An introduction to nutrient management. 7<sup>th</sup>*

Edition, Prentice Hall. Upper Saddle River, NJ.

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

## Lecture Schedule

Lec. No.	Contents
1.	Soil - composition - mineral matter, organic matter, soil water, soil air - soil profile, Master horizons - List of important soil properties – physical, chemical and biological.
2.	Soil colour - Munsell colour chart - Hue, Value, Chroma - Importance of soil colour. Soil Texture - définition – Types and Importance of soil texture.
3.	Soil structure - définition - Cementing agents - Classification - Significance of soil structure - Bulk density, Particle density and Pore space - Definition - their Optimum range
4.	Soil water -Definitions of Infiltration, Percolation - Field capacity, wilting point, available soil water - Soil air - Composition - Significance in crop production
5.	Soil temperature - Soil temperature management - Factors affecting soil physical properties - Soil reaction - Measurement of soil pH, Ranges in soil pH, Acidic, neutral, alkaline, calcareous - Effect of pH on nutrient availability - Soil electrical conductivity - Measurement of soil EC - Rating of soil EC - Effect on crop growth.
6.	Carbon Cycle - C : N ratio– Definition, optimum C : N ratio and Soil Organic Matter (SOM) - Sources - Factors affecting - Importance on soil properties
7.	Soils of Tamil Nadu - Area, constraints, Crop suitability - Alluvial soil, Black Soil, Red Soil, Laterite soil.
8.	Problem soils - Physical constraints and management- Slow permeable soils, Excessively Permeable, Sub soil hardening /hard pan, Surface crusting, Fluffy paddy soils, Shallow soils
9.	Problem soils - Chemical constraints and management - Acid soils - Saline soils - Sodic soils and their Management - Lime and gypsum requirement
10.	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.
11.	Plant nutrients - Classification - Primary, secondary and micronutrients - Forms of nutrients absorbed by plants - deficient, critical range, sufficient, luxury consumption - Soil Fertility, Soil productivity – Definitions
12.	Major Role , deficiency symptoms and correction measures of primary, secondary and micro nutrients in plants - Use of VDK

13.	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)
14.	Major N,P,K fertilisers, Secondary nutrients and Micronutrient fertilizers their nutrient content
15.	Mixed fertilizers and water soluble fertilizers - Ingredients - points to be noted for preparing fertilizer mixture - advantages and disadvantages of fertilizer mixtures. Method of fertilizer application - Broadcasting, Placement, Nutriseed Pack, Foliar application, fertigation - fertilizer solubility
16.	Techniques to enhance Nutrient Use Efficiency - split application, slow release fertilisers, LCC based fertilizer recommendation - chelated fertilizers
17.	Enriched FYM and organic manures, method of application, liming of acid soils, nutrient solubilising and mobilizing microbes - Integrated nutrient management (INM) – components and importance

### 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. 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
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
6.	Determination of soil colour
7.	Determination of soil moisture by oven dry method
8.	Analysis of soil for pH and EC

9.	Determination of gypsum requirement for sodic soil
10.	Determination of lime requirement for acid soil
11.	Irrigation water quality analysis - pH, EC
12.	Irrigation water quality analysis - 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.	Collection and identification of manures
18.	Collection and identification of fertilizers
19.	Identification of nutrient deficiencies symptoms in crops
20.	Working out fertilizer requirement for crops using straight fertilizers
21.	Working out fertilizer requirement for crops using complex fertilizers
22.	Working out fertilizer requirement for INM and organic farming
23.	Working out fertilizer requirement using STCR equation
24.	Demonstration of DISSIFER software
25.	Demonstration of VDK software
26.	Field visit and calculation of nitrogen requirement using leaf color chart (LCC)
27.	Learning about Soil Health Card
28.	Preparation of nutrient solution for foliar spray
29.	Preparation of enriched FYM
30.	Preparation of Micronutrient enriched organic manures
31.	Preparation of mixed fertilizers and their compatibility
32.	Preparation of slow release fertilizers - coated fertilizers
33.	Revision
34.	Final practical examination

## HOR A 101 Nursery Technology of 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 - Establishment of mother plant block/ scion bank- 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 in horticultural crops - Propagation by tissue culture methods in horticultural crops - Water and nutrient management, plant protection measures in nursery - Project preparation for nursery establishment - Certification of nurseries-Visit to commercial nurseries -Tissue culture units / State Horticulture farms

### Course outcome

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

### Reference

- N Kumar 2020, Introduction to Horticulture, 7<sup>th</sup> Edition. Oxford and IBH Publishing Co Pvt. Ltd., New Delhi, India
- T. K. Bose, S. K. Mitra, M. K. Sadhu, P. Das and D. Sanyal. 2010. Propagation of Tropical & Subtropical Horticultural crops, Volume 1 (3<sup>rd</sup> Revised edition). NayaUdyog, 206, BidhanSarani, Kolkata 700006.
- Sharma, R.R.2005. Propagation of Horticultural Crops – Principles and Practices, Kalyani Publishers, New Delhi
- Sadhu, M.K.1989. Plant Propagation. Wiley Eastern Ltd., 4835/24, Ansari Road, Daryaganj, New Delhi 110 002.

### Practical schedule

Ex. No.	Content
1	Selection of nursery site and nursery components 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 -Maintenance of propagated plants in nursery beds Establishment of mother plant block/ scion bank - Selection criteria for plus trees - Establishment and maintenance - Certification of nurseries

2	<p>Media for propagation of nursery plants and pot mixture preparation  Media - definition- Properties of good media - Soil, sand, peat, sphagnum moss, vermiculite, perlite, pumice, leafmould, sawdust, cocopeat, farmyard manure-  Media sterilization- Potmixture - ingredients, composition and preparation methods for different horticultural crops</p>
3	<p>Containers, tools and implements for nursery  Containers for different kinds of plants, earthen pots of different sizes, plastic pots, polythene bags, grow bags, Jiffy bag, bricks - Tools (rose can / water can, crow bar, garden shears, scythe, digging fork, shovel, secateurs, budding and grafting knife, hand hoe, spade, pruning saw, tree pruner, garden fork, garden rake, rocker sprayer, backpack sprayer, trolley) - Implements (rotavator, cultivator, disc plough, bund former, tractor drawn auger)</p>
4.	<p>Plant propagation structures  Advantages &amp; disadvantages - Greenhouse structures - Mist chamber, Shade net house, Insect Proof Net house, Poly house, Plastic tunnels</p>
5.	<p>Seed propagation  Methods to break seed dormancy - advantages of flat bed, raised bed and polybag nursery - preparation of flat bed, raised bed and polybag nursery- sowing, raising of seedlings - Cost of seedling production</p>
6.	<p>Protray nursery techniques  Protray nursery - Advantages &amp; disadvantages -protray sizes- media composition - sowing- raising of seedlings - maintenance in nursery- care during transport- Cost of seedling production</p>
7	<p>Practicing propagation by cuttings in horticultural crops  Advantages &amp; disadvantages - 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)- Root cuttings - Use of rooting hormones</p>
8.	<p>Practicing propagation by layering in horticultural crops  Advantages and disadvantages - Ground layering (simple layering, compound or serpentine layering, tip layering, trench layering, mound layering) - Air layering</p>

9.	Practicing propagation by grafting in horticultural crops Grafting, root stock, scion, advantages & disadvantages - Criteria for root stock selection - Preparing of scion - Methods -inarching or approach grafting, epicotyl or stem grafting, softwood grafting, side grafting, whip or splice grafting, whip and tongue grafting, cleft grafting, veneer grafting, bark grafting, bridge grafting
10.	Practicing propagation by budding in horticultural crops Advantages & disadvantages- Criteria for root stock selection - characters of bud wood, criteria for bud wood selection – Methods - shield or ‘T’ budding or inverted 'T' budding- patch budding- chip budding- flap or forked budding- ring budding- fluted budding
11.	Propagation by specialized plant parts - Bulb, Corm, Tuber, Tuberous roots and stem, Rhizome, Runner, Offset sucker, Division, Stolon, Bulbils, Crown etc.
12.	Tissue culture techniques in horticultural crops Advantages and disadvantages -Components of Tissue culture unit- explants, media, sterilization and protocols in micro propagation, hardening techniques
13.	Water, nutrient management and IPDM for nursery Irrigation methods - sprinkler irrigation - fertilizer types - water soluble fertilizers, bio fertilizers, organic manures, care and maintenance of plants in nursery Plant protection measures - Integrated pests and diseases management, diagnosis of nutrient deficiencies and corrective measures - Integrated pest and disease management - Bio control agents
14.	Project preparation for nursery establishment Area, purpose, establishment cost- mother block for scion and root stock, mist chamber, shade net house, insect proof net house cost, fixed cost and recurring cost, cost benefit analysis Establishment cost for prostrate nursery, community nursery, - fixed cost - recurring cost - cost benefit analysis
15.	Visit to commercial nurseries / commercial tissue culture units / state horticulture farms
16.	Revision
17.	Final practical examination

## **ENG X101 Agricultural Engineering practices 0+2**

### **Objective**

To give hands on practice to understand important concept and practices of irrigation, farm machinery and agricultural Processing equipment , their use in agriculture, and their operation.

### **Practical syllabus**

#### **Farm Power and Machinery**

Mechanization and its advantages and constrains. Farm power sources - Tractor, its controls and operation. Procedure for operating tractor and Power tiller. Tillage - objectives - type of tillage - ploughing methods - animal drawn tillage tools. Chisel plough, Mould board plough, disc plough. Secondary tillage - purpose- equipment for secondary tillage -cultivators, harrows and rotary tillers- their operation. Land shaping with levellers, ridgers and bund formers. Planting machines- tractor drawn seed drills and planters- their calibration and operation. Mechanization of rice cultivation- tractor and power tiller operated puddlers. Rice transplanting- raising rice nursery and use of transplanters. Weeding tools- manual long handled weeders for wet and dry land operation. Use of power operated weeders. Plant protection equipment- manual and power operated equipments- their operation and safe pesticide and weedicide application practice. Harvesting and threshing of crop, principle of operation of combine harvester.

Machinery used in mechanization of horticulture - auger diggers, vegetable nursery machine- machinery for lawn and garden maintenance, fruit harvesters, coconut tree climbers.

#### **Agricultural Process Engineering**

Physical properties of grains- size, bulk density. Importance and determination of moisture content of gains . Study of grain drying methods and grain drying practice using mechanical drying. Grain cleaning- exercises in operating winnower, and cleaner cum graders. Shelling and de-husking, practice with ground nut sheller. Paddy parboiling and milling- visit to mechanized rice mill. Operation of dhal mill and millet mill. Oil milling- operation of oil mill- visit to oil mill. Grain storage, methods of storing grains, exercise in study of quality of stored grain.

#### **Irrigation Engineering**

Measurement of agricultural land and understanding documents relating to land. Conventional irrigation practice- measuring irrigation water requirement. Methods of conserving and using water for irrigation, irrigation requirement based on soil moisture. Drip irrigation and fertigation systems, their layout- measuring discharge of dripper- maintenance and operation of drip and sprinkler irrigation systems. Study of different

types of well. Irrigation structures. Agricultural pump and its operation and maintenance. Green house and its principles- visit to green house and study of its operation. Farm structures for housing animals, and waste disposal structures.

### **Renewable Energy**

Bio gas plant- types, technique for proper operation of biogas plant. Solar electric pump system used in agriculture, study of electric fence. Study of gassifier and improved Chula. Application of biomass as energy source for agricultural operations. Exercise in use of solar tunnel dryers for drying agricultural produces.

### **Course outcome**

The students will gain experience in application of agricultural Engineering practices on the farm. The student will be able to carry out simple operations in irrigation, operation of farm machinery, processing equipment and, renewable energy gadgets on the farm.

### **References/ Text books**

- Jagdishwar Sahay. 2010. Elements of Agricultural Engineering. Standard Publishers and Distributors. Delhi.461 p. ISBN: 81-8014-044-X.
- ChakravertyAmalendu and Paul Singh R. 2014.,Post harvest technology adn food process engineering , CRC Press ISBN-13: 978-1-4665-5321-7
- Sahay KM and Singh KK , 2001.,Unit operations of Agricultural Processing. Vikas Publishing House Pvt.Ltd.

### **Practical schedule**

<b>Ex.No.</b>	<b>Content</b>
1.	Mechanization and role of machinery in agriculture. Study of different power sources used in farm operations. Exercise in identifying the make model and power of tractors, power tillers , diesel engines, electric motors
2.	Investigation of physical properties of grains, examination of different grains like rice, wheat, pulses, groundnut etc to understand variability in geometry and physical behaviour- finding bulk density and thousand grain weight
3.	Introduction to tractor, and power tiller and their important controls. Exercise in identifying the different controls of tractor and power tiller. Procedure for operating a tractor and power tiller in the field.Safety in operating farm machinery
4.	Experiments on drying of grains, measuring the rate of drying , understanding the need for drying grains .Equipment to measure grain moisture, understanding importance of moisture in storing grains

5.	Tillage and its objectives, Study of animal drawn tillage equipments, method of attaching animals to yoke, ploughing by country plough. Tractor drawn chisel plough and its use.
6.	Experiments in operation of bin type grain dryer and study of different grain dryers.
7.	Tractor drawn mould board plough, and disc plough, their important components and their function, Exercise in hitching a plough to tractor and adjusting it for ploughing, observing the plough in operation
8.	Study of winnower, exercise in measuring the cleaning efficiency,. Study of grain cleaners .
9.	Different tractor drawn secondary tillage implements, their selection and use, observing operation of cultivator, and disc harrow, rotavator, bund former and ridger.
10.	Manual and power operated groundnut shellers, exercise in measuring the shelling performance
11.	Study of tractor operated seed drill, calibration of seed drill, observing performance of seed drill. Study of tractor operated planter, calculating the seed requirement for given plant spacing. Observing the performance of a planter and recording the seedspacing
12.	Study of millet mill , dhal mill and the procedure adopted in millet de-husking and dhal milling
13.	Study of different weeding tools and machinery, exercise with hand operated long handled weeders, observing weed removal efficiency, operation of power weeder.
14.	Visit to a rice mill and studying the rice parboiling and milling process
15.	Rice cultivation machinery- Land preparation for lowland rice- puddlers. Paddy transplanter, exercise in preparing tray nursery for rice, transplanting practice.
16.	Oil milling, Exercise in finding the oil recovery from groundnut/ coconut in a oil gahni . Principles of oil extraction/ visit to oil mill
17.	Manually operated plant protection equipment, study of different sprayers and dusters and their operation, safety in handling and application of chemicals
18.	Principles of grain storage, methods of preventing spoilage, Exercise in assessing spoilage in stored grain. Study of Grain storage structures/ Visit to grain storage structure.
19.	Horticultural machinery, auger digger, mechanization of vegetable crop cultivation, bush cutters, lawnmowers, chainsaws. Pruning tools. Methods of harvesting fruit trees- coconut tree climber
20.	Study of multicrop threshers. Study of combine harvester. Exercise in understanding the different adjustments to enable proper harvesting and threshing.Field visit to observe rice combine harvester in operation

21.	Measurement of land area- Exercise in measuring regular and irregular fields. Calculating area and conversion of area. Documents relating to farm lands and understanding the same.
22.	Irrigation, principles, conventional irrigation practices, Exercise in measuring irrigation water required for an area using different techniques
23.	Conservation and storage of water, farm ponds, water required for irrigation . Exercise in finding irrigation water requirement by soil moisture measurement.
24.	Study of drip and drip fertigation systems, Components and layout. Exercise in making simple layout and measuring discharge/plant.
25.	Exercise in measurement of irrigation water, and soil moisture. Calculation of irrigation water requirement based on soil moisture. Exercise in assembling and operating model sprinkler irrigation system.
26.	Study of different types of wells and their suitability to different areas. Study of pump, pump operation and maintenance.
27.	Green house and its maintenance. Irrigation practices for green house. Visit to green house/ vegetable nursery.
28.	Animal housing and waste disposal structures, farm structures for irrigation.
29.	Study on operation and maintenance of biogas plant.
30.	Study of operation of solar photovoltaic pumping system, measuring water output, electric fence and its maintenance.
31.	Exercise on operation of gasifier/ thermal efficiency testing.
32.	Exercise on operation of solar crop dryer, drying studies on agricultural products.
33.	Revision /conducting special practical / Practical record book submission
34.	Final practical examination

## COM X 101 English Language and Computer Applications 0+1

### Objectives

- To make the students competent in day-to-day and Professional Communication skills
- To understand about use of computer and to learn basic computer applications
- To understand the basics of computers and its applications
- To understand the basics of MS Word, MS Excel and MS PowerPoint

### Practical Syllabus - English Language

#### Unit I

**Listening:** Listening Cloze (Comprehension) - Note Taking

**Speaking:** Self Introduction - Short Speech (Impromptu) - Welcome Address & Vote-of-Thanks

#### Unit II

**Reading:** Reading Techniques - SQ4R - Skimming and Scanning

**Writing:** Paragraph Writing - Essay Writing- Letter Writing - Précis Writing

**Integrated skills:** Group Discussion - Resume writing - Interview Skills

### Course Outcome

- The students will be familiarized with LSRW Skills -Speaking, Listening, Reading and Writing Skills in English and improve their presentation skills.
- Students will have basic understanding of computers and its applications. They will acquire knowledge about the basic office packages, internet and agricultural websites.

### Text Books

- Hariharan,S, Sundararajan.N. Suresh.M. &Thangaraj.K. & et al., English for Effective Communication. Coimbatore, Thannambikkai publications, 2014. Third edition.
- Hariharan.S, Sundararajan.N, Shanmugapriya.S.P. (2010), Soft Skills, MJP Publishers, Chennai- Republished at 2017.

### References

Goodale, Malcolm, Professional Presentations, Cambridge University, 2005.

Greenbaum Sidney, Oxford English Grammar, New Delhi, Oxford University Press. Peregoy, 2009.

Jones Daniel, English Pronouncing Dictionary, Cambridge University Press, 2006.

Krishnaswamy. Modern English A Book of Grammar Usage and Composition, Chennai, Macmillan India Limited, 2010.

Murphy, Raymond. Intermediate English Grammar, Cambridge University Press; Second edition 1999)

### **Practical Syllabus - Computer Applications**

#### **Unit III Introduction to Computers**

Computer Definition: Hardware - Input devices, Output devices, CPU, Memory concepts. Software Definition: System software & Application software; Operating System - Basics of GUI - Windows OS; Application Software - Basics of Open Source Software - Office package.

#### **Unit IV Internet and E-Mail**

Internet Definition - Applications of Internet; World Wide Web and Web Browsers, Search Engines; Basics of Computer networks - LAN, WAN and MAN; Wireless network - Wi-Fi. Connecting to internet; URL; Domain name; IP Address; Website Definition - Agricultural Websites - Agritech portal. Basics of Email: Sending and Receiving mails.

#### **Unit V Basics of MS Word, MS Excel and MS PowerPoint**

Introduction to MS Office: MS Word - opening, closing, saving and printing of documents; Text creation and formatting; Table handling- insertion, deletion, alignment; Find and replace; Spell check. MS Excel - opening, saving and closing spreadsheet. Formulas: Sum, Average, Count, Min and Max; Charts - line, bar and pie chart/graph. MS PowerPoint - creating, opening and saving a presentation; Working with slides; Insert: picture, clipart, smart art and shapes; Slide view; Animations – slide and text transition.

#### **Text books**

- Computer Basics: Absolute Beginners Guide, Michael Miller, 8<sup>th</sup> Edition, Que Publication
- Learning Computer, Fundamentals, MS Office and Internet & Web Technology, Third Edition, Firewall Media Publication

#### **References**

Introduction to Computer Fundamentals, Bright SiawAgrijie, Second Edition, Trafford Publication

Basic Computer for Beginners, Web Wise Seniors, 2003

Learning MS Word and MS Excel – 2010, RohitKauraha

#### **E References**

[https://www.tutorialspoint.com/computer\\_fundamentals](https://www.tutorialspoint.com/computer_fundamentals)

### Practical Schedule - English Language

Ex. No.	Content
1.	Listening to Audio/Video- Listening Cloze(Comprehension) - Note taking
2.	Self-introduction - Short Speech (Impromptu)-Preparation of Model Speeches and Demonstration
3.	One minutes speech - Welcome Address & Vote-of-thanks
4.	Reading techniques - SQ4R application on a select essay- Skimming and Scanning - Application by Reading a select passages/ Essay - class room Activities
5.	Paragraph Writing Exercises- Analysis of select Dialogues and Paragraphs Practicing - Essay writing Graham's Flowchart- Application of the flow chart on a Model essay followed by exercises
6.	Letter writing - Personal and Official Letter Writing - Study of select letters (e.g. Personal invitation, request letters, complain letters, job application)- exercises
7.	Group Discussion-Practice- Mock Group Discussion - Resume writing- Study of select resumes and their components - Exercise on Preparing Resume of the individual student.
8.	Interview skills Preview of recorded interviews - Conduct of Mock Interview
9.	Computer - definition; Basic concepts of Hardware - Input devices, Output devices, CPU; Memory concepts - Primary and Secondary memory; Applications of Computer.
10.	Software Definition : System software & Application software; Operating System - Basics of GUI - Windows OS ; 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; Basics of Open Source Software - Office package.
11.	Application Software Definition - Installing/Uninstalling an Application software; Virus and antivirus definition; Exploring Files-Creating, renaming and searching of files and folders, usage of Help menus.
12.	Internet Definition - Applications of Internet; World Wide Web and Web Browsers, Search Engines; Basics of Computer networks - LAN, WAN and MAN; Wireless network Definition–Wi-Fi. Connecting to internet; Definition - URL; Domain name; IP Address; Website Definition - Agritech portal.
13.	Basics of Electronic mail (Email); Sending, attachment, BCC, CC and Receiving mails; Accessing sent mails, Spam, Trash; Email settings.
14.	Introduction to MS Office package. 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 - header & footer, symbols. Formatting of text; Table handling- insertion, deletion, alignment; Find and replace; Spell check.
15.	MS Excel basics -Creating, Opening and Saving a spreadsheet worksheets basics; Formulas/Function: Sum, Average, Count, Min and Max; Chart - line, bar and pie chart/graph.
16.	MS PowerPoint - Creating, Opening and Saving a presentation; Working with slides -insert, delete, basic layouts; Insert: picture, clipart, smart art and shapes. Slide view - normal, slide sorter, slide show and handouts; Animations - slide and text transition and revision.
17.	Final practical examination

## Diploma in Agriculture

### Syllabus- 2020

#### II Semester

Sl.No.	Course No.	Course Title	Credit hours
1.	AGR A 101	Agronomy of Field Crops I	1+1
2.	AGR A 102	Crop Production I (Wetland crops)	0+2
3.	AGB A 101	Agricultural Crop Varieties and their maintenance	1+1
4.	HOR A 102	Production Technology of Fruit and Vegetable Crops	2+1
5.	AGM A 101	Agricultural Microbiology and Environmental Studies	1+2
6.	PED X 101	Physical Education*	-
		<b>Total Credits</b>	<b>5+7</b>

Note: PED X 101 course offered from first semester is registered in second semester and evaluation will be done at the end of second semester

## AGR A 101 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 - IFS models.

### 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.

### Theory Schedule

Lec. No.	Content
1.	Agronomic Practices of Transplanted rice & SRI - climatic - soil - land preparation - seeds and sowing- varieties- irrigation - fertilizer management - weed management - intercultural operations- harvesting
2.	Agronomic Practices of Direct seeded( wet & Dry) rice - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management - intercultural operations- harvesting.
3.	Agronomic Practices of Semi Dry rice - climatic - soil - land preparation - seeds and sowing - varieties - irrigation - fertilizer management - weed management - intercultural operations- harvesting.
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 cumbu - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management - intercultural operations- harvesting.
8.	Agronomic practices for ragi - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management –intercultural operations- harvesting
9.	Agronomic practices for minor millets, tenai, samai, - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management - intercultural operations- harvesting.
10.	Agronomic practices for minor millets, varagu, panivaragu - climatic - soil - land preparation - seeds and sowing- varieties - irrigation - fertilizer management - weed management - intercultural operations- harvesting.
11.	Agronomic practices for minor millets 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 systemsand Integrated Farming system models for Wetland and garden land

## 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
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.	Visit to wetland and garden land IFS unit models in their institute
10.	Estimation of plant population per unit area for important crops.
11.	Practicing foliar spray of DAP and pulse wonder to pulses.
12.	Recording biometric observation on growth parameters of Cereals and Pulses.
13.	Recording biometric observation on yield parameters, assessing maturity and estimation of yield of cereals and pulses.
14.	Visit to nearby research station.
15.	Working out cost of cultivation and economics of important crops – rice, maize, black gram and red gram.
16.	Revision
17.	Final practical examination

## **AGR A 102 Crop Production-I (Wetland crops) 0+2**

### **Objectives**

To learn and acquiring skill on the package of practices of low land rice.

### **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. There should not be repetition of crop in AGR A 102 Crop Production-I (Wetland crops) 0+2, AGR A 202 Crop Production II (Irrigated crops) 0+1 and AGR A 203 Crop Production III (Dryland Crops) 0+1

### **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 A 101 Agricultural crop varieties and their maintenance 1+1

### Objective

To acquire practical knowledge on agricultural crops varieties

### Theory Syllabus

Modes of reproduction - classification of crops based on pollination - varieties - hybrids - definition - types of varieties - hybridization techniques - general process of varietal development - Varieties, synthetics, composites and hybrids of agricultural crops: rice, sorghum, pearl millet, maize, finger millet, small millets, redgram, blackgram, greengram, cowpea, horsegram, groundnut, sesame, sunflower, castor, coconut, cotton, sugarcane, guinea grass, cumbu napier grass, cenchrus, lucerne, desmanthus and subabul - Germplasm - importance of germplasm and its management - maintenance and management of traditional varieties.

### Practical Syllabus

Identification of varieties, synthetics, composites and hybrids of agricultural crops and observation of their morphological and biometrical traits: rice, maize, sorghum, pearl millet, maize, finger millet, small millets, redgram, blackgram, greengram, cowpea, horsegram, groundnut, sesame, sunflower, castor, coconut, cotton, sugarcane, guinea grass, cumbu napier grass, cenchrus, lucerne, desmanthus and subabul - Hybrid seed production using male sterile line in rice and redgram and observing the characteristics of A, B and R lines - laying of varietal trials and maintenance of records.

### Course Outcome

Students will be familiarized with the latest and popular varieties of agricultural crops and their salient features and their importance.

### References

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

### Web source

TNAU Agritech portal

### Theory Schedule

Lec. No.	Content
1.	Modes of reproduction - classification of crops based on pollination - varieties - hybrids - definition - types of varieties
2.	Hybridization techniques - general process of varietal development

3.	Short duration and medium duration varieties and hybrids of rice, their characteristics and salient features
4.	Traditional varieties and long duration varieties and hybrids of rice, their characteristics and salient features
5.	Varieties and hybrids of sorghum and pearl millet, their characteristics and salient features
6.	Synthetics, composites and hybrids of maize, their characteristics and salient features
7.	Varieties of finger millet and other small millets, their characteristics and salient features - role of small millets and nutritional security.
8.	Varieties and hybrids of redgram, their characteristics and salient features
9.	Varieties of blackgram, greengram, cowpea and horsegram, their characteristics and salient features
10.	Varieties of groundnut under different varietal groups, their characteristics and salient features
11.	Varieties of sesamum and sunflower, their characteristics and salient features
12.	Varieties of castor and coconut, their characteristics and salient features
13.	Varieties and hybrids of cotton and Bt cotton, their characteristics and salient features
14.	Clonal varieties of sugarcane, their characteristics and salient features
15.	Varieties and hybrids of guinea grass, cumbu napier grass, cenchrus, lucerne, desmanthus and subabul, their characteristics and salient features
16.	Germplasm - importance of germplasm and its management
17.	Maintenance and management of traditional varieties

### Practical Schedule:

Ex. No.	Content
1.	Identification of rice varieties and observation on morphological and biometrical traits.
2.	Hybrid seed production using male sterile lines in rice and observation on the characteristics of A, B and R lines
3.	Identification of sorghum and pearl millet varieties and observation on morphological and biometrical traits
4.	Identification of synthetics, composites and hybrids of maize and observation on morphological and biometrical traits
5.	Identification of finger millet and other small millets varieties and observation on morphological and biometrical traits
6.	Identification of redgram varieties and observation on morphological and biometrical traits
7.	Identification of blackgram, greengram, cowpea and horsegram varieties and observation on morphological and biometrical traits
8.	Identification of groundnut varieties and observation on morphological and biometrical traits
9.	Identification of sesamum and sunflower varieties and observation on morphological and biometrical traits
10.	Identification of castor and coconut varieties and observation on morphological and biometrical traits

11.	Identification of cotton varieties and hybrids and observation on morphological and biometrical traits
12.	Identification of sugarcane varieties and observation on morphological and biometrical traits
13.	Identification of forage crop varieties and hybrids of guinea grass, cumbu napier grass, cenchrus, lucerne, desmanthus and subabul and observation on morphological and biometrical traits
14.	Laying of varietal trials and maintenance of records and visit to breeding research station for varietal identification
15.	Visit to hybrid seed production plots and parental seed production plots of any two crops of rice, maize, cotton and sunflower
16.	Revision
17.	Final practical examination

## **HOR A 102 Production Technology of Fruit and Vegetable Crops 2+1**

### **Objective**

To understand the production technology of important fruit and vegetable crops

### **Theory syllabus**

Importance and scope of fruit crop cultivation -Study of production technology of fruit crops with reference to soil, climate, varieties, propagation, planting systems, irrigation, nutrient management, fertigation and weed management, training and pruning, role of growth regulators- physiological and nutritional disorders, harvest, yield, post harvest technology-grading, packing and storage. Tropical fruits: mango, banana, papaya, guava, sapota, grapes, citrus (acid lime and sweet orange) Sub-tropical and temperate fruits: mandarin orange, pine apple, jackfruit, avocado, apple, pear Arid zone fruit crops: aonla, pomegranate, annona, jamun, Importance of vegetables - nutritive value - types of vegetable garden: kitchen garden/ nutrition garden, truck garden and market garden - Roof top garden -Vertical farming - Hydroponics - Aeroponics - Study of production technology of vegetable crops with reference to soil, climate, varieties, manuring, irrigation, fertigation, weed management - use of growth regulators, special horticultural practices, harvesting and yield of tomato, brinjal, chillies, bhendi,; gourds – (ridge gourd, bitter gourd, watermelon, ashgourd) ; onion, garlic; temperate vegetables (cauliflower, cabbage); Tuber vegetables (potato) and root vegetables (tapioca) perennial vegetables (moringa) and leafy vegetables (amaranthus) - organic production technologies in vegetables, organic certification - physiological and nutritional disorders and their corrective measures- Protected cultivation of vegetables (cucumber, tomato and capsicum).

### **Course outcome**

The students will get familiarized with the production technologies of fruit and vegetable crops

### **References/ Text books**

- Kumar. N. 2020. Introduction to Horticulture, 7<sup>th</sup> Edition Oxford and IBH Publishing Co Pvt. Ltd., New Delhi, India
- Vishnu Swarup. 2014. Vegetable Science and Technology in India. Kalyani Publishers., New Delhi
- Chadha. K.L. 2003. Handbook of Horticulture. ICAR Publications
- TNAU Agritech portal

## Theory schedule

Lec. No.	Content
1.	Importance and scope of fruit crop cultivation, classification of fruit crops Cultivation practices of mango Soil, climate, varieties, propagation, planting systems, HDP, UHDP, irrigation, nutrient management, fertigation, weed management, training and pruning
2.	Cultivation practices of mango Special/inter cultivation practices – role of growth regulators- physiological and nutritional disorders, harvest and yield
3.	Cultivation practices of banana Soil, climate, varieties, propagation, planting systems, HDP, irrigation, nutrient management, fertigation, weed management
4.	Cultivation practices of banana Special cultivation practices, role of growth regulators - physiological and nutritional disorders, harvest and yield
5.	Cultivation practices of guava Soil, climate, varieties, rootstocks, propagation, planting systems, HDP, UHDP, irrigation, nutrient management, fertigation, weed management, special cultural practices, physiological and nutritional disorders, harvest and yield
6.	Cultivation practices of grapes Soil, climate, varieties, rootstocks, propagation, planting systems, irrigation, nutrient management, fertigation, weed management, training and pruning, role of growth regulators, physiological and nutritional disorders, harvest and yield
7.	Cultivation practices of papaya Soil, climate, varieties, propagation, planting systems, irrigation, nutrient management, fertigation, weed management, physiological and nutritional disorders, harvest and yield
8.	Cultivation practices of sapota Soil, climate, varieties, rootstocks, propagation, planting systems, irrigation, nutrient management, weed management, training and pruning, harvest and yield
9.	Cultivation practices of citrus (acid lime, sweet orange) Soil, climate, varieties, rootstocks, propagation, planting systems, irrigation, nutrient management, weed management, training and pruning, role of growth regulators - physiological and nutritional disorders – harvest and yield
10.	Cultivation practices of mandarin orange, pine apple Soil, climate, varieties, rootstocks, propagation, planting systems, irrigation, nutrient management, weed management, role of growth regulators - physiological and nutritional disorders - harvest and yield

11.	Cultivation practices of jackfruit and avocado Soil, climate, varieties, propagation, planting systems, irrigation, nutrient management, weed management, harvest and yield
12.	Cultivation practices of apple Soil, climate, varieties, rootstocks, propagation, planting systems, HDP, UHDP, irrigation, nutrient management, weed management, training and pruning, role of growth regulators - physiological and nutritional disorders – harvest and yield
13.	Cultivation practices of pear Soil, climate, varieties, rootstocks, propagation, planting systems, HDP, UHDP, irrigation, nutrient management, weed management, training and pruning, role of growth regulators - physiological and nutritional disorders – harvest and yield
14.	Cultivation practices of aonla Soil, climate, varieties, propagation, planting systems, irrigation, nutrient management, weed management, training and pruning, role of growth regulators, physiological and nutritional disorders – harvest and yield
15.	Cultivation practices of pomegranate Soil, climate, varieties, propagation, planting systems, irrigation, nutrient management, weed management, training and pruning, harvest and yield
16.	Cultivation practices of jamun and annona Soil, climate, varieties, propagation, planting systems, training and pruning, irrigation, nutrient management, weed management, role of growth regulators, physiological and nutritional disorders - harvest and yield
17.	Pre and post-harvest technology of fruit crops Pre harvest practices -maturityindices- harvesting methods - grading - pre and post-harvest treatments - packing methods - storage- value addition- processing
18.	Importance of vegetables and its nutritive value Scenario of vegetable production in Tamil Nadu-Recommended Dietary Allowance of vegetables - composition of nutrients, vitamins and minerals of different vegetable crops
19.	Types of vegetable garden : Kitchen /nutritional garden, truck garden and market garden (commercial garden) Selection of site - layout - cropping programme for kitchen / nutrition garden - roof top garden Vertical farming - Hydroponics - Aeroponics
20.	Cultivation practices of tomato Soil, climate, varieties/hybrids, seed rate, spacing, irrigation, nutrient management, fertigation, weed management, training, role of growth regulators, maturity indices, harvesting and yield

21.	<p>Cultivation practices of brinjal</p> <p>Soil, climate, varieties/hybrids, seed rate, spacing, irrigation, nutrient management, fertigation, weed management, role of growth regulators, maturity indices, harvesting and yield</p>
22.	<p>Cultivation practices of chillies</p> <p>Soil, climate, varieties/hybrids, seed rate, spacing, irrigation, nutrient management, fertigation, weed management, role of growth regulators, maturity indices, harvesting and yield</p>
23.	<p>Cultivation practices of bhendi</p> <p>Soil, climate, varieties/hybrids, seed rate, spacing, irrigation, nutrient management, fertigation, weed management, maturity indices, harvesting and yield</p>
24.	<p>Cultivation practices of gourds (Ridge gourd, bitter gourd, watermelon, ashgourd)</p> <p>Soil, climate, varieties/hybrids, seed rate, spacing, irrigation, nutrient management, fertigation, weed management, training, role of growth regulators, maturity indices, harvesting and yield</p>
25.	<p>Cultivation practices of onion and garlic</p> <p>Soil, climate, varieties/hybrids, planting material requirement, spacing, irrigation, nutrient management, fertigation, weed management, role of growth regulators, maturity indices, harvesting, yield and storage</p>
26.	<p>Cultivation practices of cauliflower and cabbage</p> <p>Soil, climate, varieties/hybrids, seed rate, spacing, irrigation, nutrient management, fertigation, weed management, role of growth regulators, special horticultural practices (blanching), maturity indices, harvesting and yield</p>
27.	<p>Cultivation practices of potato</p> <p>Soil, climate, varieties/hybrids, planting material requirement, spacing, irrigation, nutrient management, fertigation, weed management, role of growth regulators, special horticultural practices maturity indices, harvesting, yield and storage</p>
28.	<p>Cultivation practices of tapioca</p> <p>Soil, climate, varieties, sett requirement, spacing, irrigation, nutrient management, fertigation, weed management, role of growth regulators, maturity indices, harvesting and yield</p>
29.	<p>Cultivation practices of leafy vegetables (amaranthus)</p> <p>Soil, climate, varieties, irrigation, seed rate, spacing, nutrient management, weed management, harvesting and yield</p>

30.	Cultivation practices of moringa Soil, climate, varieties, seed/ planting material requirement, spacing, irrigation, nutrient management, weed management, role of growth regulators, special cultural practices (pinching, pollarding and ratooning in moringa,) maturity indices, harvesting and yield
31.	Organic production technologies in vegetable crops and organic certification
32.	Physiological and nutritional disorders and their corrective measures in major vegetables Symptoms of nutrient and physiological disorders – management
33.	Protected cultivation of vegetables (Tomato, Capsicum and Cucumber) Preparation of media, fumigation, varieties, manuring, irrigation, fertigation, foliar nutrition, weed management - use of growth regulators, Special cultural practices (training, pruning, disbudding), maturity indices, harvesting and yield
34.	Pre harvest practices - harvesting - pre cooling - grading - packaging - storage - cold chain - value addition of major vegetable crops

### Practical syllabus

Identification of fruit varieties-planning & layout of an orchard-planting systems-selection of planting materials-planting methods-intensive crop cultivation systems-HDP & UHDP-training & pruning-special canopy management-fertigation-mulching-working out fertilizers requirements-special cultivation practices-diagnosis-Nutrient and Physiological disorders-corrective measures

Nursery management practices in vegetable crops- Nutrient management -Weed management- growth regulator application- Special horticultural practices in vegetable crops- Practices in protected cultivation of vegetable crops- Visit to Post harvest handling and value addition units of vegetable crops / polyhouse unit/Progressive farmers field- Visit to Community nursery /Organic certified vegetable field

### Practical Schedule

Ex. No.	Content
1.	<b>Identification of varieties of tropical, subtropical, temperate and arid zone fruit crops</b> Tropical fruits: mango, banana, papaya, guava, sapota, grapes, citrus (acid lime and sweet orange) Sub-tropical and temperate fruits: mandarin orange, pine apple, jackfruit, avocado, apple, pear Arid zone fruit crops: aonla, pomegranate, annona, jamun

2.	<p><b>Planning and layout of orchards for different fruit crops</b></p> <p>Field preparation, ploughing, leveling, soil and water sampling and analysis, layout for different planting systems - Vertical row planting pattern (square system, rectangular system, cluster system, double hedge row system, HDP &amp; UHDP) - Alternate row planting pattern (hexagonal system, diagonal or quincunx system, triangular system)</p>
3.	<p><b>Selection of planting materials and planting methods of fruit crops</b></p> <p>Selection of quality planting materials in fruit crops (banana - sucker &amp; tissue culture plantlets), mango, sapota, guava - selection criteria for grafts Pit preparation - manual and machineries for pit preparation, spacing</p>
4.	<p><b>Intensive crop cultivation systems in fruit crops</b></p> <p>HDP and UHDP methods – special training and pruning methods - mango and guava Training and pruning systems for grapes (Bower system, Espalier system, Kniffin system, Telephone system, Tatura trellis, forward and back pruning )</p>
5.	<p><b>Fertigation: Study of components, lay out and scheduling</b></p> <p>Advantages of drip fertigation- characteristics of fertilizers for fertigation- sources of nutrients- precautions to be taken during fertigation - time of application- fertigation equipments Working out fertilizer requirement for important fruit crops- conversion factor for chemical fertilizers - calculation for direct and water soluble fertilizers</p>
6.	<p><b>Special cultivation practices &amp; special pruning techniques for enhancing productivity</b></p> <p>Special cultivation practices (staking, propping, desuckering, denavelling, mattocking) Special pruning techniques (root pruning, ringing, notching, smudging, bending, coppicing, pollarding, lopping, pinching, disbudding, thinning)</p>
7.	<p>Rejuvenation of senile and old orchards –methods- top working- grafting methods- after care</p>
8.	<p>Diagnosis of nutrient and physiological disorders - corrective measures for fruit crops</p>
9.	<p><b>Nursery management practices in vegetable crops</b></p> <p>Seed treatment and sowing Community nursery - Media for protray- sowing of seed and management Vegetative propagation (Minisett technique in cassava, Grafting - Brinjal)</p>
10.	<p><b>Nutrient management</b></p> <p>Calculation of fertilizer doses for vegetable crops and practical exercises in fertilizer application Fertigation – Fertigation scheduling with Water soluble fertilizers Practical exercises and calculation for micronutrient spray</p>

11.	<b>Weed management</b> Method of herbicide application-spray volume calculation Mulching-Organic and Inorganic mulch, weed mat
12.	<b>Plant Growth regulator in Vegetable production</b> Preparation of spray solution and application <i>viz.</i> , Ethrel, Triaccontanal, NAA.
13.	<b>Special horticultural practices in vegetable crops</b> Training and pruning (Tomato, Capsicum and Cucurbits), Truss hooking (Tomato), Disbudding (Tomato and Capsicum), Blanching (Cauliflower), Pinching, Pollarding and Ratooning (Moringa)
14.	<b>Practices in protected cultivation of vegetable crops</b> Protected cultivation practices of tomato, capsicum and cucumber
15.	Visit to processing units/ polyhouse /Progressive farmers field/ Community nursery /Organic certified vegetable field
16.	Revision
17.	Final practical examination

## AGM A 101 Agricultural Microbiology and Environmental Studies 1+2

### Objective

This course is designed to give students an understanding on what are microbes, their role in agriculture, industry and environment. The course encompasses the application of microorganisms as biofertilizers, biocontrol agents, compost production, microbial value addition and preparation of different fermented foods.

### Theory syllabus

Microorganisms (bacteria, fungi, actinobacteria, yeast & algae)-Role of microorganisms in agriculture, industry and environment. - Fermentation processes. Biofertilizers - classification & types - mass production methods, dosage and methods of application. Biocontrol agents-types - mass production. Shelf life, Quality control and BIS / FCO standards of biofertilizers. Microbes in fermented foods- Probiotics - cheese, yogurt. Bread and Wine making. Single Cell Protein - *Spirulina* production. Environment- Components - segments - natural resources - environmental pollution - sources and impacts - waste management - wastewater and solid wastes - disaster management.

### References

- Michael J. Pelczar, JR., E.C.S. Chan, Noel R. Krieg, 2005. *Microbiology*  
Casida, JR. L.E. 2006. *Industrial Microbiology*, New Age International Publishers, New Delhi.  
Subba Rao, N.S., 1999. *Soil Microorganisms and Plant growth*, Oxford & IBA, New Delhi.  
P.D.Sharma, Ecology and Environment. 2017.(13<sup>th</sup> Edition),: Rastogi Publications, New Delhi  
Tandon, Compost Handbook. 2017. FDCO, New Delhi, India.  
Jambhhekar, and Hemangee, 2002. *Vermiculture in India* - on line training material, Maharashtra Agricultural Bioteks, Pune, India

### Web sources

- <http://www.eartheasy.com>
- <http://www.compostingcouncil.org>
- <http://www.epa.gov/compost>
- <http://www.compost.css.cornell>

### Theory schedule

Lec. No.	Content
1.	Microorganisms - bacteria, fungi, actinomycetes, yeast and algae. Difference between Prokaryotes and Eukaryotes.

2.	Importance of microorganisms in Agriculture and Industry-Commercially important fermentation processes.
3.	Biofertilizers - Importance, Types & Classification -nitrogen fixers, phosphorus solubilizers, potash mobilizers, zinc solubilizers and PGPR.
4.	Bacterial biofertilizers - <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Rhizobium</i> Phosphobacteria and Potash bacteria - mass production - Formulations - and application methods.
5.	Algal biofertilizers- BGA & Azolla-Mass production-Dosage & methods of application.
6.	Mycorrhizae types - Mass production of AM fungi - Uses - methods of Application.
7.	Biocontrol agents - types - Mass production-bacterial, fungal & viral - Role in pest and disease management.
8.	Shelf life and Quality control standards (BIS/FCO) of Biofertilizers & Biocontrol agents.
9.	Industrial application of microbes - Bread, Wine, Alcohol (Ethyl alcohol), antibiotics and Penicillin production
10.	Fermented foods - Sauerkraut - Probiotics - Cheese and Yoghurt. Single cell protein (SCP) - <i>Spirulina</i>
11.	Introduction to environment - components and segments
12.	Natural resources - status, importance and conservation
13.	Environmental pollution - sources and impacts
14.	Waste management concepts
15.	Wastewater treatment - primary, secondary and tertiary
16.	Solid waste management techniques - composting and vermicomposting
17.	Disaster types & Management

### Practical syllabus

Introduction to microbiology Instruments / glasswares - Sterilization - Media - Types-Preparation of media for bacterial biofertilizers - Pilot scale production of bacterial biofertilizers - mass production of Algal, *Azolla* and AM fungal biofertilizers -Production of biocontrol agents - production of wine, bread(or visit), cheese, yogurt, Sauerkraut - *Spirulina* mass production / visit.

Environmental Sampling techniques - Characterization of water/wastewater - pH, EC, TSS, TDS, total hardness, BOD, COD, Enumeration of total coliforms - Wastewater treatment methods (physical/chemical/biological) - Characterization of solid wastes - pH, EC, Organic carbon, nitrogen (C:N ratio) - Composting methods - biocompost - vermicompost - Production techniques - Monitoring of composting parameters - Compost maturity assessment - Assessing the nutritive value of compost (Total N, P, K ) - Visit to composting units

## Practical schedule

Ex. No.	Content
<b>Microbiology</b>	
1.	Introduction of microbiology instruments and glasswares.
2.	Sterilization & preparation of different types of media
3.	Isolation and enumeration of bacteria-Serial dilution and plating and MPN method
4.	Isolation of N fixing bacterial biofertilizer- <i>Rhizobium</i> / <i>Azospirillum</i> / <i>Azotobacter</i>
5.	Isolation of P solubilizers-Phosphobacteria / potash bacteria
6.	Isolation of PPFM &PGPR
7.	Mass production of bacterial biofertilizers / Visit to biofertilizer production laboratory
8.	Mass production of AM fungi
9.	Mass production of Algal and <i>Azolla</i> biofertilizers
10.	Mass production of biocontrol agents- <i>Bacillus subtilis</i> (or) <i>Trichoderma</i>
11.	Quality control of bacterial biofertilizers-population check - Serial dilution / MPN methods
12.	Quality control of fungal biofertilizers- Infection percentage & spore counts of AM fungi
13.	Production of cheese/ yoghurt
14.	Production of wine
15.	Production of sauerkraut /pickles
16.	Spirulina production
17.	Bread making - Visit to bakery unit
<b>Environment</b>	
18.	Environmental sampling techniques - wastewater and polluted soil
19.	Estimation of pH, EC, TSS, TDS in water/wastewater
20.	Estimation of total hardness in water/wastewater
21.	Estimation of BOD, COD in water/wastewater
22.	Enumeration of total coliforms in wastewater
23.	Effect of wastewater treatment methods (Physical- Adsorption, Chemical - Coagulation, biological - EM)
24.	Estimation of pH, EC, Organic carbon in solid waste
25.	Estimation of total nitrogen and C:N ratio in solid waste
26.	Solid waste composting - heap method
27.	Vermicomposting techniques
28.	Monitoring of composting parameters - Temperature and Moisture
29.	Compost maturity assessment - Qualitative test, germination test
30.	Assessing the nutritive value of compost - Total Nitrogen

31.	Assessing the nutritive value of compost - Total Phosphorus and potassium
32.	Visit to composting unit / wastewater treatment plant
33.	Buffer classes
34.	Final practical examination

**Diploma in Agriculture  
Syllabus - 2020**

**III Semester**

<b>Sl. No.</b>	<b>Course No.</b>	<b>Course Title</b>	<b>Credit hours</b>
1.	AGR A 201	Agronomy of Field Crops II	1+1
2.	AGR A 202	Crop Production II (Irrigated crops)	0+1
3.	AEN A 201	Economic Entomology, Crop Pests and their Management	1+2
4.	PAT A 201	Crop Diseases and their Management	1+2
5.	SST A 201	Seed Production Techniques in Agricultural and Horticultural Crops	1+1
6.	CAG A 201	Commercial Agriculture I	0+2
		<b>Total Credits</b>	<b>4+9</b>

## AGR A 201 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 - Narcotics - tobacco, Forages - fodder sorghum, fodder maize, fodder cumbu, cumbunapier 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.

### 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.

### Theory Schedule

Lec. No.	Content
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
9.	Sugarcane ratoon management - SSI
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 curing, pit curing.
12.	Cropping system and farming systems involving oil seeds and commercial crops - sequential cropping - intercropping
13.	Agronomic Practices of Cereal fodder - climatic - soil - land preparation - seeds and sowing - varieties - irrigation - fertilizer management - weed management - intercultural operations - harvesting and anti-nutritional factors in forages.
14.	Agronomic Practices of Grass & Tree fodder fodder - climatic - soil - land preparation - seeds and sowing - varieties - irrigation - fertilizer management - weed management - intercultural operations - harvesting and anti-nutritional factors in forages
15.	Agronomic Practices of Legume - climatic - soil - land preparation - seeds and sowing - varieties - irrigation - fertilizer management - weed management - intercultural operations - harvesting and anti-nutritional factors in forages
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

<b>Ex. No.</b>	<b>Content</b>
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.	Practicing sett treatment and planting in sugarcane.
10.	Estimation of plant population per unit area for important crops.
11.	Practicing delinting in cotton and seed hardening for rainfed crops.
12.	Visit to dryland IFS model unit in the Institute.
13.	Observation on growth parameters of oil seeds, fibres, sugars and commercial crops.
14.	Observation on yield parameters, assessing maturity and estimation of yield of oil seeds, fibres, sugars and commercial crops.
15.	Working out cost of cultivation and economics of important crops – Groundnut, sesame, cotton and sugarcane.
16.	Revision
17.	Final practical examination

## **AGR A 202 Crop Production II (Irrigated crops) 0+1**

### **Objectives**

To learn and acquiring skill on the package of practices of irrigated upland crops.

### **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. There should not be repetition of crop in AGR A 102 Crop Production-I (Wetland crops) 0+2, AGR A 202 Crop Production II (Irrigated crops) 0+1 and AGR A 203 Crop Production III (Dryland Crops) 0+1

### **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.

## **AEN A 201 Economic Entomology, Crop pests and their management 1+2**

### **Objectives**

To understand the fundamentals of insect's life, body structures and functions, economic importance, pest categories, injury and damage, pest management methods in field and horticultural crops.

### **Theory Syllabus**

Understanding the basics of insect's life, distinguishing characters, life cycle and processes. Types of insect wings and legs-importance in flight and locomotion. Economic importance of insects - harmful and beneficial insects. Pest - Insects & non- insects: categories of insect pests- pest outbreak- pest monitoring - pest surveillance- forecasting - Economic Threshold Level. Pest management methods - cultural, physical, mechanical, behavioural, host plant resistance, botanical, biological control, chemical control and legal methods.

Crop pests- nature of damage and symptoms, life cycle and management: Field crops - rice, sorghum, maize, cumbu, ragi, blackgram, greengram, redgram, cowpea, groundnut, gingelly, sunflower, castor, cotton, sugarcane; Horticultural crops - greens, curry leaf, brinjal, tomato, bhendi, chillies, onion, cucurbits, crucifers, moringa, tapioca, coconut, turmeric, banana, mango, citrus, guava, grapes, sapota, rose, jasmine, tuberose, crossandra & major medicinal plants. - Pests of stored products and their management. Rodents and other non- insect pests and management.

### **Course outcome**

The students will be familiarized with basic understanding of insects, economic importance, categories of pests, detection of injury caused by pests and assessment of damage, concepts in monitoring and forecasting, various IPM strategies and inputs and pesticide application methods.

### **References/ Text books**

- B.V. David & V.V. Ramamurthy. 2016. Elements of Economic Entomology, 8th Edition. Brillion Publishers, New Delhi.
- Regupathy.A and R. Ayyasamy. 2019 (IV Edition). A guide on crop pests. Namrutha Publicaitons, Chennai.389 p.
- Dhaliwal G.S., and Ramesh Arora.2004. Integrated Pest management concepts and approaches, Kalyani publishers, Calcutta.427p.
- Muthukrishnan, N., N.Ganapathy, R.Nalini and R.Rajendran.2005. Pest Management in Horticultural Crops. New Madura Publishers, Madurai. 325p. ISBN: 81-902832-0-0
- Srinivasan. G, R. Pandiyan and P. Karthik.2018. General and economic entomology (Diploma standard). Institute of agriculture, Kumulur, Trichy.163 p.

## Theory schedule

Lec. No.	Content
1.	Understanding the fundamentals of insect's life, life cycle and processes Introduction to entomology, insect's life, life cycle, feeding, breeding, shelter, locomotion, migration, defense, mimicry and dominance.
2.	Economic importance of insects –Harmful & Beneficial insects – Representation by flow chart <i>viz.</i> , 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 (Productive and helpful insects aiding in pollination, natural enemies and scavengers etc.)
3.	Pest-Insects and non-insects: Categories of insect pests- pest outbreak- pest monitoring- pest surveillance- forecasting- Economic Threshold Level Explanation on pests, and terms used. Categories of pests based on occurrence, based on level of infestation and based on the loss; causes of pest outbreak <i>viz.</i> , 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. 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. Economic Threshold Level.
4.	Introduction to pest management methods: cultural, physical, mechanical and behavioural methods in pest management Explanation on pest management and need. Methods in practice-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 <i>etc.</i> ) and Community level practices. Merits and demerits of cultural control. Physical methods of pest control <i>viz.</i> , manipulation of temperature, moisture, light, air, use of irradiation, use of abrasive dusts and use of greasing materials. Merits and demerits of physical control. Mechanical 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 <i>viz.</i> , light traps, pheromone traps, yellow sticky trap, bait trap, fish meal trap and pitfall trap. Merits and demerits of mechanical methods. Behaviour modifying chemicals (Intra specific and inter specific semiochemicals) and use of pheromones in pest management (Monitoring, mass trapping and mating disturbance).

5.	<p>Introduction to pest management methods: host plant resistance, botanical and biological suppression methods in pest management</p> <p>Explanation on Host Plant resistance- mechanisms of resistance (antixenosis, antibiosis and tolerance); use of resistant varieties for pest management with examples in major field and horticultural crops, compatibility of HPR in IPM.</p> <p>Explanation on 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.</p> <p>Role of parasitoids in pest management of major crops with classical examples, dose and time of release. Merits and demerits of biological control.</p> <p>Microbial control - Definition, Classical examples for viruses (Nucleo Polyhedrosis Virus, Granulosis Virus), bacteria (obligate and facultative bacteria), fungi (Green muscardine) and nematodes in pest management.</p>
6.	<p>Introduction to pest management methods: chemical control and legal methods in pest control</p> <p>Classification of pesticides based on target organisms (Insecticides, rodenticides, acaricides, avicides, molluscicides, nematocides, fungicides, bactericides, herbicides).</p> <p>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. Insecticide groups. Insecticide formulations.</p> <p>Legal methods of pest control - Pests accidentally introduced into India, foreign pest from which India is free; plant quarantine, Insecticide Act and phytosanitary certificate.</p>
7.	<p>Crop pests- nature of damage, symptoms and management- rice, sorghum, maize, cumbu and ragi</p> <p>Biology, damage symptoms and management of pests of rice: stem borer, gall midge, leaf folder, brown plant hopper, green leaf hopper, thrips, earhead bug, mealy bug, blackbug and cutworm.</p> <p>Biology, damage symptoms and management of pests of sorghum, maize, cumbu and ragi: shoot fly, stem borers, earhead bug, fall armyworm, gall midge, ear head caterpillar/ cob borer, aphids and ash weevil.</p>
8.	<p>Crop pests – nature of damage, symptoms and management- Pests of blackgram, greengram, redgram, lablab, cowpea, groundnut, gingelly, sunflower and castor</p> <p>Biology, damage symptoms and management of pests of pulses- 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,</p> <p>Biology, damage symptoms and management of pests of groundnut, gingelly, sunflower and castor: red hairy caterpillar, groundnut leaf miner, termite, groundnut podborer, tobacco caterpillar, castor capsule borer, hairy caterpillars, semiloopers, gingelly leaf webbercum capsuleborer, sphingid, gingelly leaf hopper and sunflower headborer.</p>
9.	<p>Crop pests- nature of damage, symptoms, and management- cotton and sugarcane</p> <p>Biology, damage symptoms and management of pests of Cotton: surface weevil, leaf hopper, aphid, whitefly, mealy bug, stem weevil, bollworm complex, red</p>

	<p>cotton bug and dusky cotton bug.</p> <p>Biology, damage symptoms and management of pests of Sugarcane: borer complex, root grub, termites, scales, pyrilla and woolly aphid.</p>
10.	<p>Crop pests- nature of damage, symptoms, and management- greens, curry leaf, brinjal, tomato and bhendi</p> <p>Biology, damage symptoms and management of pests of greens: amaranthus stem weevil, leaf webber;</p> <p>Biology, damage symptoms and management of pests of curry leaf: psyllid, leaf roller, Hadda beetle, ash weevil.</p> <p>Biology, damage symptoms and management of pests of brinjal: shoot and fruit borer, brinjal leaf hopper, tomato fruit borer, tomato pinworm, serpentine leaf miner, tobacco caterpillar, bhendi fruit borers, whitefly and mites.</p>
11.	<p>Crop pests- nature of damage, symptoms, and management- moringa, onion, cucurbit and crucifers</p> <p>Biology, damage symptoms and management of pests of moringa: budworm, leaf worm, moringa hairy caterpillar, moringa fruit fly</p> <p>Biology, damage symptoms and management of pests of onion: onion fly and thrips, cutworms.</p> <p>Biology, damage symptoms and management of pests of cucurbits: pumpkin caterpillar, pumpkin beetle, fruit flies and flea beetle.</p> <p>Biology, damage symptoms and management of pests of crucifers: diamond back moth, leaf webber, cabbage borer, cabbage butterfly and semilooper.</p>
12.	<p>Crop pests – nature of damage, symptoms, and management- chillies, turmeric, tapioca and coconut</p> <p>Biology, damage symptoms and management of pests of chillies: fruit borer, thrips, mite.</p> <p>Biology, damage symptoms and management of pests of cassava: whitefly, scales, thrips, mealybugs.</p> <p>Biology, damage symptoms and management of pests of coconut: redpalm weevil, rhinoceros beetle, blackheaded caterpillar, eriophyid mite, rugose spiralling whitefly and other whiteflies.</p> <p>Biology, damage symptoms and management of pests of turmeric: turmeric shoot borer, leaf folder and rhizome scale.</p>
13.	<p>Crop pests- nature of damage, symptoms, and management – banana, mango, citrus, grapes and sapota</p> <p>Biology, damage symptoms and management of pests of mango: hoppers, stem borer, mango mealy bug, mango nut weevil, mango shoot and leaf webber, orange borers, red ant.</p> <p>Biology, damage symptoms and management of pests of citrus: fruit sucking moth, lemon butterfly, leaf miner and citrus psyllid.</p> <p>Biology, damage symptoms and management of pests of banana: rhizome weevil, pseudostemweevil, aphid, tingid bug,</p> <p>Biology, damage symptoms and management of pests of guava: fruit borer, fruitfly, tea mosquito bug and pink mealy bug.</p> <p>Biology, damage symptoms and management of pests of grapevine: stem gridler, flea beetle, mealy bug, thrips, fruit sucking moth,</p>

	Biology, damage symptoms and management of pests of sapota: leaf webber, bud worm, hairy caterpillar.
14.	Crop pests – nature of damage, symptoms, and management - rose, jasmine, tuberose, crossandra and major medicinal plants Biology, damage symptoms and management of pests of jasmine: bud worm, leaf webber, eriophyid mite. Biology, damage symptoms and management of pests of rose: leaf cutter bee, scales, thrips, red spider mite, aphids, bud borers Biology, damage symptoms and management of pests of tuberose: mites and mealybugs. Biology, damage symptoms and management of pests of insect pests of crossandra: Biology, damage symptoms and management of pests of medicinal crops viz., Catharanthus, Senna, Gloriosa and Ocimum spp.
15.	Pests of stored products and their management Pests of stored pests - Damage symptoms and management of rice weevil, rice moth, Angoumois grain moth, pulse beetle, red flour beetle, cigarette beetle, sweet potato weevil, potato tuber moth.
16.	Rodents and their management Rodent Pests: Field rat, House rat, House mouse, Indian gerbil, Mite and avian pests and their management
17.	Non- insect pests and their management Mites: Economically important mites in field and horticultural crops and their management.

### Practical Syllabus

Collection and preservation of insects-External features of grass hopper-metamorphosis & feeding habits- Characteristics of common & economically important insects; grasshoppers, preying mantis, dragonflies & damselflies, termites, thrips, bugs, greenlace wings, true flies, butterflies & moths, beetles & weevils, ants, bees & wasps. Sericulture: mulberry cultivation, rearing of mulberry silk worm, improved methods and appliances, management of pest & diseases. Apiculture-bee species, castes and their duties-colony management, bee enemies, bee keeping appliances, honey extraction and processing. Pests of stored products. Rodents and other non- insect pests. Study of economically important parasitoids and predators - botanicals in pest management-groups of insecticides in Study of formulations, label information and toxicity parameters of different insecticide groups - plant protection appliances. Nature of damage and types of injury caused by pests. Assessment of insect population and damage-Identification of injury and damage symptoms of field crops - rice, sorghum, maize, cumbu, ragi, blackgram, greengram, redgram, lablab, cowpea, groundnut, gingelly, sunflower, castor, cotton, sugarcane; horticultural crops-greens, curry leaf, brinjal, tomato, bhendi, chillies, cucurbits, crucifers, moringa, tapioca, onion, coconut, turmeric, mango, banana, citrus, guava, grapes, sapota, rose, jasmine, tuberose, crossandra and major medicinal plants.

## Practical Schedule

Ex. No.	Content
1.	Study of external features of grasshopper General body structure, head, thorax, abdomen and their appendages.
2.	Collection, preservation and display of insects- (Aerial net and sweep net), Aspirator and Berlese funnel; Killing - preparation of cyanide/ethyl acetate killing bottle, Pinching the thorax; Preservation -Paper folds (Paper envelopes),Relaxing container, setting, methods of pinning, mounting, labeling and display.
3.	Metamorphosis, feeding habits and locomotion of important insects General outline of life cycle and complete metamorphosis in insect life-types of metamorphosis (grasshopper, dragonflies, plant hoppers, true flies, thrips, butterflies, moths, beetles, weevils, wasps and bees). Feeding habits of insects- elementary knowledge on biting and chewing type, piercing and sucking (bug type), chewing and lapping type, rasping and sucking, mandibulosuctorial type, sponging type and siphoning type of mouth parts with examples. Locomotion in insects- flight-wings and types (membranous, tegmina, elytra, hemelytra, halteres, fringed and scaly wings); Insect legs; legs and their types (walking, running, jumping, digging, clinging, preying, swimming and foragial legs).
4.	Characteristics of common and economically important families of insects- preying mantis, dragonflies & damselflies, termites, greenlace wings, thrips, bugs (Body, structure, feeding apparatus, legs and wings).
5.	Characteristics of common and economically important families of insects- true flies, butterflies & moths (Body, structure, feeding apparatus, legs and wings).
6.	Characteristics of common and economically important families of insects- beetles & weevils, ants, bees & wasps(Body, structure, feeding apparatus, legs and wings).
7.	Sericulture-Mulberry cultivation and rearing of mulberry silkworm 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)
8.	Sericulture - Improved methods and appliances, management of pest and diseases in silkworm maintenance Types of chawki rearing (Paraffin paper rearing, box rearing and co operative rearing) and types of late age worm rearing (Shelf rearing, floor rearing and shoot rearing). Types of mountages, disinfectants, pest and diseases of silk worm.
9.	Apiculture- bee species, castes and their duties Different Bee species (Indian bee, Italian bee, rock bee, little bee and stingless bee), castes and duties of castes in honey bee colony.
10.	Colony management, bee enemies and diseases 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 - Important pests of honey bees (Greater wax moth, lesser

	wax moth, bee hunter wasp, yellow banded wasp, ants, termite, lizard, king crow <i>etc.</i> ). Bee diseases - brood diseases (American foul brood, European foul brood, sac brood, thai sac brood and fungal) and adult diseases (acarine, Nosema and amoebic).
11.	Bee keeping appliances, honey extraction and processing Types of bee hives, appliances, honey extraction and processing
12.	Study of economically important parasitoids and predators Predators: green lacewings, ladybird beetles, assassin bug, syrphid, dragonfly and preying mantids with examples Parasitoids: egg parasitoids, egg larval parasitoids, larval parasitoids, pupal parasitoids and adult parasitoids with examples.
13.	Study of botanicals in pest management Botanicals from root and aerial portions. Identification of plants (Catharanthus, Vitex, Ocimum & Neem) and usefulness in pest management.
14.	Study of groups of insecticides in chemical control Insecticide groups classification based on mode of action and chemical group-organic and inorganic compounds-OC, OP, Carbamates, Synthetic pyrethroids, neonicotinoids, diamides, phenylpyrazoles, avermectins, spinosyns, ketoenols, Juvenile hormone mimics and chitin synthesis inhibitors
15.	Study of formulations, label information and toxicity parameters of different insecticide groups. Introductory knowledge on the formulation of insecticides-Ingredients in the formulation and their role with examples - EC, D, G, WP, SP, SL, OD etc.,- Liquid, solid and gaseous formulations- label information, Toxicity symbols, colour and warning.
16.	Study of plant protection 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).
17.	Nature of damage and types of injury caused by pests Types of damage to plants-Direct effects of feeding- Injury by chewing insects, piercing and sucking insects, internal feeder, Injury by subterranean feeders, stored product feeders; indirect effects of feeding- Harvest difficulty, contamination, egg laying, nest making.
18.	Assessment of insect population and damage 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).
19.	Identification of injury and damage symptoms caused by pests- rice Rice stem borer, gall midge, leaf folder, brown plant hopper, green leaf hopper, thrips, earhead bug, mealybug and cutworm
20.	Identification of injury and damage symptoms caused by pests-sorghum, maize, cumbu and ragi Shootfly, stem borers, earhead bug, fall armyworm, gall midge, ear head caterpillar/ cob borer, aphids and ash weevil

21.	<p>Identification of injury and damage symptoms caused by pests-blackgram, greengram, redgram, lablab and cowpea</p> <p>Stemfly, aphid, whitefly, pod borers (gram podborer, spotted podborer, blue butterfly, plume moth, podfly, podwasp), blister beetle, podbugs and pulse beetle</p>
22.	<p>Identification of injury and damage symptoms caused by pests-groundnut, gingelly, sunflower and castor</p> <p>Red hairy caterpillar, groundnut leaf miner, termite, groundnut podborer, tobacco caterpillar, castor capsule borer, hairy caterpillars, semiloopers, gingelly leaf webber cum capsule borer, sphingid, gingelly leaf hopper and sunflower headborer.</p>
23.	<p>Identification of injury and damage symptoms caused by pests-cotton and sugarcane</p> <p>Leaf hopper, aphid, whitefly, mealybug, stem weevil, bollworms, red cotton bug and dusky cotton bug, sugarcane borers, root grub, termites, scales, pyrilla and woolly aphid</p>
24.	<p>Identification of injury and damage symptoms caused by pests-greens, curry leaf, brinjal, tomato and bhendi</p> <p>Amaranthus stem weevil, leaf webber, curry leaf psyllid, leaf roller, Hadda beetle, ash weevil, 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.</p>
25.	<p>Identification of injury and damage symptoms caused by pests- moringa, onion, cucurbits, crucifers</p> <p>Moringa budworm, leaf worm, moringa hairy caterpillar, moringa fruit fly, onion fly and onion thrips, pumpkin caterpillar, pumpkin beetle, fruit flies and flea beetle, diamond back moth, leaf webber, cabbage borer, cabbage butterfly and semilooper.</p>
26.	<p>Identification of injury and damage symptoms caused by pests- Chillies, tapioca, turmeric, coconut</p> <p>Chilli fruit borer, thrips, mite, tapioca – mealy bug and white fly, turmeric shoot borer, leaf folder and rhizome scale, red palm weevil, rhinoceros beetle, black headed caterpillar, eriophyid mite, rugose spiraling white fly.</p>
27.	<p>Identification of injury and damage symptoms caused by pests-mango and banana</p> <p>Mango hoppers, stemborer, mango mealy bug, mango nut weevil, mango shoot and leaf webber, Banana rhizome weevil, pseudostem weevil, aphid.</p>
28.	<p>Identification of injury and damage symptoms caused by pests- citrus, guava, grapes, sapota</p> <p>Orange borers, red ant, citrus fruit sucking moth, lemon butterfly, leaf miner and citrus psyllid, tingid bug, and mealy bug. grapevine stem girdler, flea beetle, mealy bug, thrips, fruit sucking moth, tea mosquito bug, fruitfly, pink mealybug, sapota leaf webber, bud worm.</p>
29.	<p>Identification of injury and damage symptoms caused by pests-rose, jasmine, tuberose, crossandra &amp; major medicinal plants</p> <p>Jasmine bud worm, leaf webber, eriophyid mite, rose leaf cutter bee, scales, thrips, red spider mite, aphids, bud borers and mite in tube rose, pests of crossandra and medicinal plants viz., Catharanthus, Senna, Gloriosa, Ocimum.</p>
30.	<p>Pests of stored products Rice weevil, pulse beetle, red flour beetle, rice moth,</p>

	Angoumois grain moth, cigarette beetle, sweet potato weevil, potato tuber moth.
31.	Rodent pests Biology and nature of damage by Field rat, House rat, House mouse, Indian gerbil and their management
32.	Other non- insect pests Mites infesting crop plants, bird pests and their management
33.	Revision
34.	Final practical examination

## PAT A 201 Crop Diseases and Their Management 1+2

### Objective

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

### Theory Syllabus

Plant diseases - Definition, Causes of plant diseases - Fungi, Bacteria, Viruses and Mycoplasma - Survival and mode of spread of plant pathogens - Chemicals in plant disease management - Symptoms - Causal agent-management of Major diseases of 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) - Vegetables (Tomato, Chillies, Brinjal, Bhendi, Cucurbits, Crucifers, Citrus, Onion, Garlic) - Plantation crops (Coffee, Tea, Rubber, Coconut, Arecanut) - Spices (Turmeric, Pepper, Cardamom, Coriander, Ginger) - Flowers (Rose, Jasmine, Crossandra, Chrysanthemum) -Medicinal plants-tuber crops-Management of post-harvest diseases - Mushroom Production and management

### Course outcome

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

### References

Diseases of crop plants in India By Rangaswami, G.and Mahadevan, A.  
Diseases of fruits and vegetable crops recent management approaches By Chand G  
Diseases of fruit crops By Singh. S. R

### Lecture Schedule

Lec. No.	Content
1.	Plant Pathology - Definition - Plant diseases - Causes - Classification and types
2.	Fungi - characters - Survival and Spread
3.	Bacteria & Phytoplasma - characters - Survival and Spread
4.	Virus - characters - Survival and Spread
5.	Algae and Phanerogams - characters & Non- parasitic diseases
6.	Symptoms of Fungal diseases - Soil-borne diseases - Root rots, Wilts, Club Root, Damping off, Downey mildews

7.	Symptoms of Fungal diseases - Air-borne diseases - Leaf spots, Blast, Powdery mildews, Rust, Smut, Anthracnose, Leaf Blight, Late blight, Die-Back, Scab, White rust, Leaf-curl
8.	Symptoms of Bacterial & Phytoplasma diseases
9.	Symptoms of Virus diseases
10.	Disease management methods - Integrated Disease Management - Cultural, Resistant varieties
11.	Disease management methods - Integrated Disease Management - Physical and Mechanical
12.	Disease management methods - Chemical- Major group of Non systemic Chemical Fungicides
13.	Disease management methods - Major group of Systemic Fungicides and Antibiotics
14.	Disease management methods - Biological control
15.	Precaution and Safety measures for fungicide handling
16.	Edible Mushroom Cultivation - (Oyster)
17.	Edible Mushroom Cultivation - (milky and button)

### Practical Syllabus

Observation of Plant Pathogens- 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 25 preserved plant disease specimens)

### Practical schedule

Ex. No.	Content
1.	Microscopic observation of Fungi - Mycelial characters-Sexual and asexual spores -Resting structures - Microscopic observation of bacterial colonies - Ooze test
2.	Identification of major groups of fungicides - Contact fungicides & Systemic fungicides and Bactericides
3.	Diagnostic symptoms, cause and management strategies for major diseases of rice -Fungal Diseases
4.	Diagnostic symptoms, cause and management strategies for major diseases of rice - Bacterial, Phytoplasma and Viral Diseases
5.	Diagnostic symptoms, cause and management strategies for major diseases of maize, sorghum and cumbu
6.	Diagnostic symptoms, cause and management strategies for major diseases of ragi and other minor millets
7.	Diagnostic symptoms, cause and management strategies for major diseases of

	blackgram and greengram
8.	Diagnostic symptoms, cause and management strategies for major diseases of red gram and bengal gram
9.	Diagnostic symptoms, cause and management strategies for major diseases of groundnut
10.	Diagnostic symptoms, cause and management strategies for major diseases of sesame, sunflower and castor
11.	Diagnostic symptoms, cause and management strategies for major diseases of cotton
12.	Diagnostic symptoms, cause and management strategies for major diseases of sugarcane
13.	Diagnostic symptoms, cause and management strategies for major diseases of tobacco, betelvine and mulberry
14.	Diagnostic symptoms, cause and management strategies for major diseases of mango
15.	Diagnostic symptoms, cause and management strategies for major diseases of banana
16.	Field visit - Observation of symptoms – Herbarium collection
17.	Diagnostic symptoms, cause and management strategies for major diseases of grapes
18.	Diagnostic symptoms, cause and management strategies for major diseases of citrus, papaya, pomegranate and sapota
19.	Diagnostic symptoms, cause and management strategies for major diseases of tomato and brinjal
20.	Diagnostic symptoms, cause and management strategies for major diseases of bhendi and chillies
21.	Diagnostic symptoms, cause and management strategies for major diseases of cucurbits
22.	Diagnostic symptoms, cause and management strategies for major diseases of crucifers
23.	Diagnostic symptoms, cause and management strategies for major diseases of turmeric and ginger
24.	Diagnostic symptoms, cause and management strategies for major diseases of onion and garlic
25.	Diagnostic symptoms, cause and management strategies for major diseases of potato and cassava
26.	Diagnostic symptoms, cause and management strategies for major diseases of coconut and arecanut,
27.	Diagnostic symptoms, cause and management strategies for major diseases of tea, coffee and rubber
28.	Diagnostic symptoms, cause and management strategies for major diseases of pepper, cardamom and coriander
29.	Diagnostic symptoms, cause and management strategies for major diseases of major flower crops
30.	Diagnostic symptoms, cause and management strategies for major diseases of major medicinal crops

31.	Cultivation of Oyster and Milky Mushrooms
32.	Post-harvest diseases of stored grains, fruits and vegetables
33.	Revision
34.	Final practical examination

## **SST A 201 Seed Production Techniques in Agricultural and Horticultural Crops 1+1**

### **Objective**

To Impart practical knowledge on quality seed Production.

### **Theory Syllabus**

#### **Introduction to seed production**

Seed - importance - seed quality characteristics; Difference between seed and grain; Difference between grain production and seed production; Generation system of seed multiplication - nucleus, breeder, foundation and certified seed; Seed Multiplication Ratio (SMR) - Seed Replacement Rate (SRR); Principles of seed production - agronomic principles.

#### **Seed production in important agricultural crops**

Seed production techniques for varieties and hybrids of cereals and millets - rice, maize, sorghum and cumbu; Seed production techniques for pulses - varieties of greengram, blackgram and cowpea, varieties and hybrids of redgram; Seed production techniques for oilseeds - varieties of groundnut and sesame, varieties and hybrids of sunflower and castor; Seed production techniques for varieties and hybrids of cotton.

#### **Seed production in important horticultural crops**

Seed production techniques for varieties and hybrids of tomato, brinjal, chilli bhendi, pumpkin, ashgourd, bittergourd, snakegourd, ribbed gourd and cucumber; Seed production techniques for varieties of cluster bean, lab lab, coriander and onion.

#### **Post-harvest techniques in seed production**

Seed extraction methods; Seed processing - drying, cleaning, grading and upgrading methods and machineries; Methods of seed treatment; Seed storage - methods and containers.

#### **Seed certification and quality regulation**

Seed certification - procedures - field Inspection - field and seed standards; Seed quality regulation - salient features of Seed Act (1966), Seed Rules (1968) and Seed Control Order (1983).

### **Course outcome**

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

## References

- Agrawal, R.L. 1996. Seed Technology, Oxford & IBH Publishing Co., New Delhi.
- Copeland, L.O. 1988. Principles of seed science and technology. Surjeet Publications, New Delhi.
- Gregg, B.G., A.G. Law., S.S. Viridi and J.S. Balis. 1970. *Seed Processing*. National Seed Corp., New Delhi.
- Trivedi RK and Gunasekaran M. 2014. Compendium on seed legislations. Seeds Division, DAC, MoA, GOI, New Delhi.
- Amarjit Basra. 2008. Handbook of Seed Science and Technology. CRC Press.
- Ramamoorthy, K and K.Sivasubramaniam. 2006. Seed Technology: Ready Reckoner. Agrobios (India), Jodhpur.

## Lecture Schedule

Lec. No.	Contents
1.	Seed importance seed quality characteristics - difference between seed and grain - difference between grain and seed production.
2.	Generation system of seed multiplication nucleus, breeder, foundation and certified seed - Seed Multiplication Ratio (SMR) - Seed Replacement Rate (SRR).
3.	Principles of seed production - agronomic principles.
4.	Seed production techniques for varieties and hybrids of rice.
5.	Seed production techniques for varieties and hybrids of maize.
6.	Seed production techniques for varieties and hybrids of sorghum and cumbu.
7.	Seed production techniques for varieties of greengram, blackgram and cowpea.
8.	Seed production techniques for varieties and hybrids of redgram.
9.	Seed production techniques for varieties of groundnut and sesame.
10.	Seed production techniques for varieties and hybrids of castor and sunflower.
11.	Seed production techniques for varieties and hybrids in cotton.
12.	Seed production techniques for varieties and hybrids of tomato, brinjal chilli and bhendi.
13.	Seed production techniques of varieties and hybrids of cucurbits (pumpkin, ashgourd, bittergourd, snake gourd, ribbedgourd and cucumber).
14.	Seed production techniques for varieties of cluster bean, lab lab, coriander and onion.
15.	Seed extraction methods; Seed processing - drying, cleaning, grading and upgrading methods and machineries.

16.	Methods of seed treatment; Seed storage - methods and containers.
17.	Seed certification procedures - field inspection - field and seed standards; Seed quality regulation - salient features of Seed Act (1966), Seed Rules (1968) and Seed Control Order (1983).

### Practical Syllabus

Identification of different crop seeds; Practicing pre-sowing seed treatments - dormancy breaking, seed priming, pelleting and polymer coating; Hybrid seed production techniques - detasselling, emasculation and pollination; Supplementary pollination techniques - rice and sunflower; Field inspection - identification of off types, pollen shedders, shedding tassels and roguing; Identification of physiological and harvestable maturity indices of different crops; Visit to seed production plots; Seed extraction - wet and dry methods; Post-harvest inspection - paddy, pulses, groundnut, maize and cotton; Seed grading and upgrading techniques; Visit to seed processing unit; Seed moisture estimation, Conduct of germination test and seedling evaluation; Practicing pre-storage seed treatment and packaging; Visit to seed storage godown to study godown sanitation; Economics of seed production.

### Practical Schedule

Ex. No.	Content
1.	Identification of different crop seeds.
2.	Practicing pre-sowing seed treatments - dormancy breaking, seed priming, pelleting and polymer coating.
3.	Hybrid seed production techniques - detasselling, emasculation and pollination.
4.	Supplementary pollination techniques in rice and sunflower.
5.	Field inspection- identification of off types, pollen shedders, shedding tassels and roguing.
6.	Identification of physiological and harvestable maturity indices of different crops.
7.	Visit to seed production plots.
8.	Seed extraction - wet and dry methods.
9.	Post-harvest inspection - paddy, pulses, groundnut, maize and cotton.
10.	Seed grading and upgrading techniques.
11.	Visit to seed processing unit.
12.	Seed moisture estimation.
13.	Conduct of germination test and seedling evaluation.
14.	Practicing pre-storage seed treatment and packaging.
15.	Visit to seed storage godown to study godown sanitation.
16.	Economics of seed production and revision of portions.
17.	Final practical examination.

## CAG A 201 Commercial Agriculture I 0+2

### Organic Inputs and Composting

#### 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.	Content
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, <i>etc.</i>
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 <i>EM</i> solution preparation for composting
14.	Visit to large scale compost production unit
15.	Introduction to vermicompost - Relative merits
16.	Types of vermicomposting

17.	Requirements for vermicomposting
18.	Bedding materials, Container, pH, Moisture content, temperature specifications
19.	Materials for vermicomposting
20.	Preliminary treatment of composting material
21.	Selection of earthworm <i>species</i> for vermicomposting
22.	Small scale vermicomposting
23.	Large scale vermicomposting
24.	Preparation of vermicompost – Spreading of bedding materials
25.	Preparation of vermicompost – Introduction of live worms
26.	Preparation of vermicompost – Moisture management
27.	Collection of vermi castings and storage
28.	Collection of vermiwash
29.	Sieving and bagging of vermicompost
30.	Field application of vermicompost and observation of crop response
31.	Cost and Benefit Analysis
32.	Visit to commercial vermicompost units
33.	Revision
34.	Final practical examination

## **CAG A 201 Commercial Agriculture I 0+2 Commercial Production of Biocontrol Agents**

### **Objective**

- Focus on production of different biological control agents and scope in pest management, mass culturing hands on training, project preparation, and entrepreneurial skill development.

### **Practical Syllabus**

#### **Entomology part**

Categories of promising bio-control agents - Practicing methods of biological control - Setting up of bio-control laboratory - Preparation of project feasibility report - mass culture of host insects: *Corcyra*, pink mealy bug - Problems in production of host insects - Mass production of *Trichogramma* spp., *Bracon* spp., Green lace wing, Australian lady bird beetle - Problems in production of biocontrol agents - Quality control and assurance - Project Evaluation

#### **Pathology part**

Importance of biological control in plant disease management – Handling of equipments – sterilization techniques –Preparation of media- Collection of soil sample and Isolation of antagonists -*Trichoderma*, *Bacillus subtilis* - Maintenance of pure cultures - Morphological characterization of *Trichoderma* and *Bacillus subtilis*-Keys for the identification of lab contaminants - Assessing the efficacy *in vitro* - mode of action of antagonists - Fermentation systems and different kinds of formulations - Mass multiplication - Methods of delivery of biocontrol agents - Bio efficacy against plant diseases – Container content compatibility - packaging methods and shelf life studies of bio control agents-Cost Analysis and project preparation- Guidelines and requirements to establish a commercial bio control lab

### **Out come**

The students will learn the biocontrol agent's production techniques in such a way that they can start their own enterprise.

### **Reference**

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- Baker, K.F. and Cook, R.J. 1974. Biological control of plant pathogens. W.H. Freeman and Co. San Francisco, U.S.A.

Chet, I. 1987. Innovative approaches to plant disease control, John Wiley and Sons, New York.

Dinakaran, D, G.Arjunan&G.Karthikeyan 2003. Biological control of crop diseases.

Papavizas, G.C. 1985. *Trichoderma* and *Gliocladium*: biology, ecology and potential for biocontrol. Annu. Rev. Phytopathol. 23 : 23-54.

Maheswari ,D.K and R.C Dubey 2008 .Potential micro organisms for sustainable agriculture. I.K International Publishing House Pvt.Lts , New Delhi

Prakasam, V., Raguchander, T. and Prabakar, K. 1998. Plant Disease Management. AE Publications, Coimbatore, India.

Ahamed S and Narain U 2007 . Eco friendly management of plant diseases. Daya Publishing house , New Delhi

Utkhede, R.S. and Gupta, V.K. 1996. Management of soil borne diseases. Kalyani Publishers, New Delhi.

### Practical schedule

Ex. No.	Content
1.	Categories of bio-control agents - Predators, Parasitoids, entomopathogens & other biocontrol agents
2.	Role of bio-control agents in pest management - advantages of biocontrol agents compared to other methods - Successful cases of biological control - Compatibility with other methods
3.	Basic facilities for setting up a bio-control laboratory - Facilities and materials required for rearing the insect on natural host and synthetic diet
4.	Preparation of model project for setting up biocontrol laboratory - for production of parasitoids & Predators
5.	Preparation of model project for setting up biocontrol laboratory - for Entomopathogens
6.	Mass culturing of <i>Corcyra cephalonica</i> : Preparation of sorghum/ cumbu grain trays for feeding the caterpillars - Releasing eggs in the grains in sulphur treated broken grains - Preparation of mating cages - Sanitation of rearing unit - Control of parasitoids - Collection of adults, releasing in mating cages and collection of eggs
7.	Field collection of mealy bugs and culturing on pumpkin - Insect cages for rearing - Maintaining the mother culture for further culturing
8.	Problems in production of host insects - Pathogens and Parasites infecting the host - hyperparasitism & maintenance of host insect laboratory as per the standard procedure - maintenance of disease free colonies

9.	Mass production of <i>Trichogramma</i> spp - Acquiring nucleus culture of <i>Trichogramma</i> spp - Separation of eggs - cleaning - sterilization - preparation of egg cards - Parasitizing the egg cards with nucleus culture. Sanitation of culture room - Collection of parasitized egg cards - Field release
10.	Mass production of <i>Bracon</i> spp. - Acquiring nucleus culture - <i>Corcyra</i> larvae for Parasitizing the larvae with nucleus culture. Sanitation of culture room - Collection of Parasitoids - Field release
11.	Mass production of green lace wing - Rearing of host insect - rearing of green lace wing grubs - Group rearing & individual rearing - allowing adults for egg laying - storage and field release of eggs - Field release methods
12.	Mass production of Australian lady bird beetle - Culturing host insect - field collection of lady bird beetle adults - release of coccinellids on mealy bugs and culturing the predator - Harvesting beetles - field release
13.	Problems in production of biocontrol agents - Constraints in the production of host insects - constraints in the storage and viability - field release constraints - impact of weather parameters on the performance of biocontrol agents
14.	Quality control and assurance- Sex ratio, Emergence, Fecundity, Longevity, Parasitism, Predation, Adult size, Field performance
15.	Project evaluation - Cost involved in the production of parasitoid and predators - Prevailing market price of different biocontrol agents - Marketing strategies & Cost benefit of the project
16.	Bio-control agents and their significance in plant disease management Safety procedures for handling of equipment (Autoclave, Laminar Air Flow Chamber, Hot air oven, pH meter,)
17.	Safety procedures for handling of equipment (Electronic balance, Fermenter, Distillation unit, Spectrophotometer, Microscopes and Spiral Kneader) Good laboratory practices of a bio control lab
18.	Preparation and Sterilization of PDA and Rose Bengal agar medium, <i>Trichoderma</i> selective medium, Kings B medium and Nutrient Agar medium
19.	Collection of soil samples and isolation of <i>Trichoderma</i> Collection of soil samples and isolation of <i>Bacillus subtilis</i>
20.	Maintenance of pure cultures of <i>Trichoderma</i> and <i>Bacillus subtilis</i> Morphological characterization of <i>Trichoderma</i>
21.	Maintenance of pure cultures of <i>Bacillus subtilis</i> Keys for the identification of lab contaminants
22.	Assessing the efficacy of <i>Trichoderma</i> , under – <i>in vitro</i> Assessing the efficacy of <i>Bacillus</i> under– <i>in vitro</i>
23.	Studies on mode of action of <i>Trichoderma</i> , against soil-borne, Post-harvest and foliar pathogens: Studies on mode of action of <i>Bacillus</i> against soil-borne, Post-harvest and foliar pathogens

24.	Preparation of broth for multiplication of <i>Trichoderma</i> and <i>Bacillus</i>
25.	Different kinds of formulations- solid formulation Different kinds of formulations- liquid formulation
26.	Mass multiplication of <i>Trichoderma</i> Mass multiplication of <i>Bacillus</i>
27.	Quality analysis of <i>Trichoderma</i> Quality analysis of <i>Bacillus</i>
28.	Methods of delivery of bio control agents - <i>Trichoderma</i> Methods of delivery of bio control agents – <i>Bacillus</i>
29.	Bio efficacy of <i>Trichoderma</i> against plant diseases Bio efficacy of <i>Bacillus</i> against plant diseases
30.	Container content compatibility, packaging methods Shelf life studies of bio control agents.
31.	Cost Analysis and project preparation
32.	Guidelines and requirements to establish a commercial bio control lab
33.	Revision
34.	Final practical examination

## **CAG A 201 Commercial Agriculture I 0+2 Commercial Seed Production in Major Crops**

Students shall raise the commercially important agricultural and horticultural crops for seed production based on the demand and resource availability and shall practice techniques involved in seed production of varieties and/or hybrids. The students shall also be trained on preparation of field layout, nursery and main field preparation, pre-sowing seed treatments, sowing and planting, certification and post-harvest seed handling.

### **Practical Syllabus**

#### **Unit I - Planning for seed production and seed farm registration**

Scope and importance of seed production - generation system of seed multiplication; Planning for seed production - varieties and hybrids; Verification of seed source; Selection of land - isolation - nursery and main field preparation - field layout - pre-sowing seed treatment; Sowing and planting design - planting ratio and border rows; Preparation of sowing report and seed farm registration.

#### **Unit II - Seed crop management techniques**

Practicing crop specific seed agronomic practices; Hybridization techniques and supplementary pollination; Identification of off-types and rogues - practicing roguing; Field inspection - practicing field count, assessing field standards and seed yield estimation; Visit to private seed company.

#### **Unit III - Pre and post harvest seed management techniques**

Assessment of physiological and harvestable maturity; Pre-harvest sanitation spray; Harvesting methods and threshing; Practicing seed extraction techniques and seed drying; Crop specific post-harvest seed inspection.

#### **Unit IV - Seed processing and tagging**

Seed processing - cleaning, grading and upgrading methods; Processing machineries - operation and maintenance; Visit to seed processing unit - obtaining license for processing unit and seed sale; Assigning seed lot number, bagging, tagging and labeling.

#### **Unit V - Seed sampling, testing and storage**

Seed sampling and testing - purity, germination and moisture; Pre-storage seed treatments and packaging; Visit to seed storage godown - study of godown maintenance and sanitation; Economics of seed production of varieties and hybrids.

## References

- Agrawal, R.L. 1996. Seed Technology, Oxford & IBH Publishing Co., New Delhi.
- Singh, B.D. 2005. Plant Breeding Principles and Methods. Kalyani Publishers, New Delhi.
- Chopra V.L. 2001. Breeding Field Crops. Oxford Publications.
- Trivedi RK and Gunasekaran M. 2014. Compendium on seed legislations. Seeds Division, DAC, MoA, GOI, New Delhi.
- Amarjit Basra. 2008. Handbook of Seed Science and Technology. CRC Press.
- Ramamoorthy, K and K. Sivasubramaniam. 2006. Seed Technology: Ready Reckoner. Agrobios (India), Jodhpur.

## Practical Schedule

Ex. No.	Content
1.	<ol style="list-style-type: none"><li>1. Scope and importance of seed production - generation system of seed multiplication</li><li>2. Planning for seed production - varieties and hybrids</li><li>3. Verification of seed source</li></ol>
2.	<ol style="list-style-type: none"><li>1. Selection of land - isolation - nursery and main field preparation - field layout</li><li>2. Pre-sowing seed treatment</li></ol>
3.	<ol style="list-style-type: none"><li>1. Sowing and planting design - planting ratio and border rows</li><li>2. Preparation of sowing report and seed farm registration</li></ol>
4.	<ol style="list-style-type: none"><li>1. Practicing crop specific seed agronomic practices</li><li>2. Hybridization techniques and supplementary pollination</li></ol>
5 to 7	<ol style="list-style-type: none"><li>1. Identification of off-types and rogues - practicing rogueing</li><li>2. Field inspection - practicing field count, assessing field standards and seed yield estimation</li><li>3. Visit to private seed company</li></ol>
8 to 11	<ol style="list-style-type: none"><li>1. Assessment of physiological and harvestable maturity</li><li>2. Pre-harvest sanitation spray</li><li>3. Harvesting methods and threshing</li><li>4. Inspection of seed production fields and practicing field count</li></ol>
12.	<ol style="list-style-type: none"><li>1. Practicing seed extraction techniques and seed drying</li><li>2. Crop specific post-harvest seed inspection</li></ol>
13.	<ol style="list-style-type: none"><li>1. Seed processing - cleaning, grading and upgrading methods</li><li>2. Processing machineries - operation and maintenance</li></ol>
14.	<ol style="list-style-type: none"><li>1. Visit to seed processing unit - obtaining license for processing unit and seed sale.</li></ol>
15.	<ol style="list-style-type: none"><li>1. Assigning seed lot number, bagging, tagging and labeling</li><li>2. Seed sampling and testing - purity, germination and moisture</li></ol>

16 to 17.	<ol style="list-style-type: none"><li data-bbox="375 195 971 226">1. Pre-storage seed treatments and packaging</li><li data-bbox="375 237 1263 310">2. Visit to seed storage godown - study of godown maintenance and sanitation</li><li data-bbox="375 321 1122 352">3. Economics of seed production of varieties and hybrids</li></ol>
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**CAG A 201 Commercial Agriculture I 0+2**  
**Broiler Production**

**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**

Ex. No.	Content
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.	Commonly used ingredients in feed mixing for broilers
18.	Least cost feed formulation
19.	Observation and study of feed consumption

20.	Role, importance and use of feed additives and growth promoters
21.	Week-wise recording body weight of broilers 0-4 weeks
22.	Week-wise recording body weight of broilers 5-8 weeks
23.	Management of broilers during summer
24.	Management of broilers during winter
25.	Common basic post mortem findings to know the cause of death
26.	Examination of internal organs of poultry
27.	Mortality rate and morbidity rate assessment
28.	Dressing procedures to prepare ready to cook broilers
29.	Preparation of various poultry meat products
30.	Maintenance of records and marketing of broilers
31.	Cost analysis
32.	Economics of broiler farming
33.	Revision
34.	Final practical examination

## Diploma in Agriculture

### Syllabus- 2020

#### IV Semester

Sl. No.	Course No.	Course Title	Credit hours
1.	AGR A 203	Crop Production III (Dryland Crops)	0+1
2.	AEN A 202	Plant protection practices*	0+1
3.	HOR A 201	Floriculture, Medicinal, Spices and Plantation Crops	2+1
4.	AMP X 201	Fundamentals of Livestock and Poultry Management	2+1
5.	AEC X 201	Agricultural Economics, Marketing and Finance	0+1
6.	AEX X 201	Extension Methods for transfer of Agricultural technologies	0+1
7.	CAG A 202	Commercial Agriculture II	0+2
8.	AEX A 201	Exposure visit	0+1
		<b>Total Credits</b>	<b>4+9</b>
		<b>*Team teaching by Entomology and Pathology</b>	

## **AGR A 203 Crop Production III (Dryland Crops) 0+1**

### **Objectives**

To learn and acquiring skill on the package of practices of Short duration/ Dryland 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. There should not be repetition of crop in AGR A 102 Crop Production-I (Wetland crops) 0+2, AGR A 202 Crop Production II (Irrigated crops) 0+1 and AGR A 203 Crop Production III (Dryland Crops) 0+1

### **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.

## **AEN A 202 Plant Protection practices 0+1**

### **Objective**

- To practice the various pest control methods, mass culturing of natural enemies, pesticide appliances, application methods, calculations of pesticide requirements and use of biopesticides.
- To know about the different plant protection fungicides, equipment and its application in field level. Further the student able to assess the diseases epidemiology and to produce the biocontrol agents

### **Practical syllabus**

Practicing various pest control methods; cultural, physical, mechanical methods, behavioral approaches-botanical pesticides, mass culturing of parasitoids and predators, chemical control - practical study of groups of pesticides, their formulations and label information, pesticide application methods, pesticide requirements and safe handling of pesticides.

Plant Protection fungicides - Methods of application of fungicides - Special methods of application - Disease survey - Disease assessment- pre-Immunization techniques - Mass multiplication of Biocontrol agents

### **Course outcome**

The students will be familiarized about the plant protection equipment and mass multiplication of biocontrol agents

### **References**

- Dhaliwal G.S., and Ramesh Arora. 2004. Integrated Pest management concepts and approaches, Kalyani publishers, Calcutta.427p.
- Regupathy.A and R. Ayyasamy. 2019 (IV Edition). A guide on crop pests. NamruthaPublicaitons, Chennai.389 p.
- Srinivasan. G, R. Pandiyan and P. Karthik.2018. General and economic entomology (Diploma standard). Institute of agriculture, Kumulur, Trichy.163 p.
- Muthukrishnan, N., N.Ganapathy, R.Nalini and R.Rajendran.2005. Pest Management in Horticultural Crops. New Madura Publishers, Madurai. 325p. ISBN: 81-902832-0-0
- Principles and procedures of plant protection by Chattopadhyay. S

### Practical schedule

Ex. No.	Content
1.	Practicing various pest control methods: cultural, physical, mechanical methods, behavioral approaches- pheromone traps, light traps, bait traps, sticky traps, storage pest traps.
2.	Preparation of botanical pesticides: Practice on preparation of NSKE 5%, neem oil 3% and Notchi 10%.
3.	Practicing mass culturing of host insect, <i>Corcyra cephalonica</i> and mass culturing of insect parasitoids, <i>Trichogramma spp.</i> and <i>Bracon spp.</i> and field release of parasitoids and field release methods
4.	Practicing mass culturing of host insect. Pink mealy bug and <i>Corcyra</i> and predators Australian lady bird beetle and Green lacewing and field release methods
5.	Practical study of insecticide groups, formulations and label information Observation on different formulations and label information
6.	Calculation of insecticide requirement for field applications & safe handling- calculation of spray volume requirement, commercial formulation requirement and calculation of strength of spray fluid, safe use, handling, storage of insecticides, disposal of containers, protective clothing, and first aid measures
7.	Practicing of pesticide application methods - Types of sprayers, maintenance and calibration of spray fluid, Handling of different sprayers
8.	Plant Protection chemicals - Fungicides - Antibiotics - Identification of major groups and their usages - Precautions and Safety measure - AVPs
9.	Methods of application of fungicides - Seed treatment - Dry - wet - slurry treatment - Acid seed delinting - Pairing and Prolinage
10.	Methods of application of fungicides - Foliar spraying - Preparation of fungicidal solution - Calculation of spray fluid - Bordeaux mixture - Bordeaux paste preparation
11.	Special methods - Fungicidal application - Root feeding, corm injection, pseudostem injection
12.	Disease survey - Purpose - fixed plot and roving survey - Disease assessment (Percent Disease Incidence and Percent Disease Index)
13.	Operation of Plant Protection equipment - Duster - Sprayers - (Hand operated - Power - others)
14.	Demonstration of pre - immunization techniques - citrus tristeza virus disease management - Meristem tip culture
15.	Biocontrol agents - <i>Trichoderma</i> - <i>Bacillus</i> - Mass multiplication- its application methods
16.	Plant Protection chemicals - Fungicides - Antibiotics - Identification of major groups and their usages - Precautions and Safety measure - AVPs and revision
17.	Final practical examination

## **HOR A 201 Floriculture, Medicinal, Spices and Plantation Crops 2+1**

### **Objective**

To impart knowledge and practical skills on concepts and production practices of flower, medicinal, aromatic, 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 of flower crops- rose (loose flower), jasmine, chrysanthemum, marigold, tuberose, crossandra and cockscomb. Protected cultivation of flower crops: rose, carnation, gerbera. 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, ocimum, palmarosa, vetiver. 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, tamarind, turmeric, ginger, coriander, fenugreek, coffee, tea, coconut, arecanut, cocoa, rubber and cashew.

### **Course outcome**

Students will acquire knowledge on concepts and production practices of flower, medicinal, aromatic, spices and plantation crops

### **Reference**

- Kumar, N. 2020. Introduction to Horticulture. 7<sup>th</sup> Edition, Oxford & IBH Publishers, New Delhi.
- Farooqi, A.A. and B.S. Sreeramu. 2004. Cultivation of medicinal and aromatic crops. Universities Press
- Randhawa, G.S., and A Mukhopadhyay, 1998 Floriculture in India, Allied Publishers Limited, New Delhi
- Kumar, N., 2005, Introduction to spices, plantation crops, medicinal and aromatic plants. 2<sup>nd</sup> Edition, Oxford & IBH Publishers, New Delhi
- Chadha, K.L. 2003. Handbook of Horticulture, ICAR Publications.
- TNAU Agritech Portal

### Theory schedule

Lec. No.	Content
1.	Scope, area and production of flower crops, medicinal and aromatic crops, 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, pinching, disbudding, harvesting, yield, grading and packing.
5.	Package of practices for tuberose Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, harvesting, yield, grading and packing.
6.	Package of practices for marigold, crossandra and cockscomb Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, 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.	Home gardening - Introduction, Importance, Layout of home garden, Small and Bungalow Garden
10.	Lawn making and maintenance Importance, important characteristics of lawn, different species of grass for plains and hills, ideal site for lawn, seed sowing, dibbling, turfing, turf plastering, irrigation, fertilizer, weeding, special practices in lawn, problems in Lawn and astro turf.
11.	Important flowering annuals and herbaceous perennials - importance, classification, hints for raising of annuals, seed production techniques in annuals, list of annuals and herbaceous perennials
12.	Foliage and flowering shrubs Importance, list of flowering and foliage shrubs for different climatic zones

13.	Foliage and flowering trees Importance, classification of trees, list of flowering and foliage trees for different climatic zones
14.	Cacti, succulents, climbers and creepers Importance, list of flowering and foliage creepers and climbers, list of cacti, succulents
15.	Edges and hedges, bulbous plants Definition, Importance, list of edge and hedge plants, Flowering and foliage bulbous plants
16.	Indoor plants and interior decoration Indoor plants, importance, selection of house plants, climbing and trailing foliage plants, bushy and upright foliage plants and flowering house plants, watering, fertilizer application, cleaning and plant protection
17.	Cut flowers, importance, cut flowers for protected conditions
18.	Cut flowers for open conditions
19.	Flower arrangement Principles in fresh flower arrangement, styles of flower arrangement
20.	Bonsai culture Introduction, 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 decoration Importance and scope of dry flowers, suitability of plant species, raw material collection, harvesting stage of flowers and foliage, processing and value addition techniques - drying, bleaching, dyeing, product making
22.	Package of practices for Medicinal coleus and gloriosa Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, special practices, harvesting, yield, processing, grading and packing
23.	Package of practices for ashwagandha, and senna Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, harvesting, yield, processing, grading and packing
24.	Package of practices for palmarosa Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, harvesting, yield, processing, grading and packing
25.	Package of practices for vetiver Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, value addition and packing
26.	Package of practices for black pepper and cardamom Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
27.	Package of practices for turmeric and ginger Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, harvesting, yield, processing, grading and packing

28.	Package of practices for coriander, fenugreek and curry leaf. Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, harvesting, yield, processing, grading and packing
29.	Package of practices for clove, nutmeg, cinnamon and tamarind Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
30.	Package of practices for coffee Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, multitier cropping system, yield, processing, grading and packing
31.	Package of practices for tea Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
32.	Package of practices for coconut Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, multitier cropping system, harvesting, yield, processing, grading and packing
33.	Package of practices for cashew and arecanut Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing
34.	Package of practices for cocoa and rubber Soil, climate, varieties, propagation, cultural, manurial and irrigation practices, training and pruning, harvesting, yield, processing, grading and packing

### **Practical syllabus**

Vegetative and seed propagation techniques and nursery practices - rose (loose flower), jasmine, chrysanthemum, marigold, tuberose, crossandra, flowering annuals - Identification and propagation of shrubs, creepers and climbers- preparing ornamental garden design for home – Interiorscaping, flower arrangement, bonsai culture and dry flower production - Turf establishment and maintenance - 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 fields - visit to Botanic gardens – visit to commercial medicinal and aromatic crop fields.

### Practical schedule

Ex. No.	Content
1.	Vegetative propagation techniques in rose (loose flower), jasmine, chrysanthemum, tuberose and crossandra - cuttings - soft wood, semi hard wood, hard wood cuttings preparation - dipping with rooting hormone, planting, rooting - hardening - terminal cuttings / suckers - protray - media preparation, seed rate - seed treatment - sowing - maintenance
2.	Seed propagation techniques and nursery practices - marigold, flowering annuals - protray - media preparation, seed rate - seed treatment - sowing - maintenance
3.	Special horticultural practices in protected cultivation of flowers - soil fumigation, environmental control, pinching, disbudding, netting, bending
4.	Identification of shrubs Identifying important foliage and flowering shrubs for tropical conditions
5.	Identification of creepers and climbers Identifying important creepers and climbers for tropical conditions
6.	Practicing ornamental garden designing for home / institutions
7.	Interiorscaping with indoor plants, practicing flower arrangement, bonsai culture and dry flower production
8.	Practices in turf establishment and maintenance
9.	Identification of important medicinal crops Crops : Medicinal coleus, gloriosa, ashwagandha and senna
10.	Identification of important aromatic crops Crops :Palmarosa, vetiver
11.	Practicing the propagation techniques of important medicinal and aromatic crops Medicinal coleus, gloriosa, ashwagandha and senna Aromatic crops: Palmarosa, vetiver
12.	Nursery practices for turmeric and ginger including selection of rhizomes, treatment, protray nursery and maintenance
13.	Practicing seed treatment and sowing in coriander and fenugreek
14.	Nursery Practices for coconut and cashew Coconut-Selection of mother palm and seednuts- sowing and maintenance – seedling selection Cashew- raising rootstocks and grafting- maintenance
15.	Visit to commercial nursery/plantation / commercial flower crop fields / Botanic gardens / medicinal and aromatic crops field
16.	Revision
17.	Final practical examination

## **AMP X 201 Fundamentals of Livestock and Poultry Management 2+1**

### **Objectives**

To impart the basic knowledge on livestock and poultry husbandry (cattle, buffalo, sheep, goat, swine and poultry) for enhancing productive and reproductive performance to improve the income of rural economy and effective utilization of livestock farm resources.

### **Theory Syllabus**

#### **Introduction**

Importance of livestock and poultry in agriculture - livestock and poultry census - milk, meat and egg production status in India. State and Central Government operated Animal Husbandry Schemes - Common terminologies used in livestock and poultry - Various systems of livestock production - extensive, semi - intensive, intensive and Integrated farming system.

#### **Dairy cattle management**

Breeds of dairy cattle (Indian and exotic) - Sahiwal, Gir, Red Sindhi, Jersey and Holstein Friesian - Crossbreds - Characters of drought cattle Breeds - Kangayam cattle, Umbalachery - Breeds of buffalo - Murrah, and Surti - Economic traits of dairy cattle- Breeding methods - Importance - advantages - Selective breeding, cross breeding and grading up. Breeding Management - Definition of Oestrus cycle - Identifications of heat of all livestock species - Definition of Artificial insemination - merits and demerits - optimum time of artificial Insemination - LN2 container maintenance - Elements of Housing Management - Site selection - Types of housing - single row - double row system - head to head - tail to tail arrangement - merits and demerits - Floor space requirement for various categories of animals - Outlines of Care and management of new born calves - importance of colostrum feeding - Composition of colostrums - quantity and feeding schedule of colostrum - Management of pregnant and lactating animals - Care and Management of Work Bullocks - Methods of milking - hand milking - full hand method- stripping, knuckling - machine milking and its advantages and disadvantages - Clean milk production - Importance - Operation - Fodder management of livestock farming - Importance of green fodder - Drought Feeding management - unconventional feed - Foot and mouth disease, Hemorrhagic septicemia and anthrax - symptoms - vaccination schedule for dairy cattle - Biosecurity management - Prevention and control of Mastitis, metabolic diseases - Milk fever, Ketosis and Grass tetany - Mini metabolic profile testing - forecasting of Disease

#### **Sheep and Goat Management**

Identification of sheep breeds of Tamil Nadu - Ramnad white, Madras red,

Coimbatore, Mecheri, Vembur Trichy black Chevaadu. Identification of Goat breeds - Salem black, Kanniadu, Kodi adu, Tellicherry and Jamunapari. Economic traits - Sheep and Goat - Systems of rearing - extensive - semi intensive, intensive and tethering. Floor space requirement for young and adult - Types of Goat housing - conventional housing - Elevated platform - advantages and disadvantages - Care and management of young and adult stocks - Feeding management of Sheep and Goat - common tree fodders - unconventional Fodder and feed - grazing - Prevention and control of diseases - PPR, Enterotoxaemia, blue tongue, Sheep pox, Orf and Anthrax- symptoms - vaccination schedule - External and internal parasites management.

### **Swine management**

Breeds of swine - Breed characters of large white Yorkshire - Housing management in pigs - floor space requirement for piglets, sow and boar- 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 - Porcine Circo virus

### **Poultry management**

Introduction and Definition of broiler, layer and backyard poultry farming / Alternative poultry - Housing systems - cage and deep litter system. Merits and demerits - litter management in broiler housing. Floor space for broiler and layer - Care and management of broiler - brooding, feeding, lighting, housing and disease prevention and control measures - Care and management of layer - brooding, feeding, lighting, housing and disease prevention and control measures - Composition and formulation of ration - pre starter, starter and finisher for broilers: chick mash, grower mash and layer mash for layers - Prevention and control of Ranikhet disease, E.coli and Coccidiosis. - Aflatoxin - Farm records - Culling - Insurance of Livestock - Advantages

### **Course Outcome**

The students will acquire the basic needs of livestock and Poultry management.

### **Reference**

Hank book of Animal husbandry by ICAR, New Delhi. March 2019, Fifth reprint of Fourth revised edition.

### Lecture schedule

Lec. No.	Content
1.	Importance of livestock and poultry in Agriculture - Livestock and Poultry census - milk, meat and egg production status in India. State and Central Government operated Animal Husbandry Schemes
2.	Common terminologies used in livestock and poultry husbandry
3.	Various systems of livestock production - extensive, semi - intensive, intensive and Integrated farming system.
4.	Breeds of dairy cattle (Indian and exotic) - Sahiwal, Gir, Red Sindhi, Jersey and Holstein Friesian - Crossbreds
5.	Characters of drought cattle Breeds - Kangayam cattle, Umbalachery - Breeds of buffalo - Murrah, and Surti - Economic traits of dairy cattle
6.	Breeding methods - Importance - advantages - Selective breeding, cross breeding and grading up.
7.	Breeding Management - Definition of Oestrus cycle - Identifications of heat of all livestock species
8.	Definition of Artificial insemination - merits and demerits - optimum time of artificial Insemination - LN2 container maintenance
9.	Housing Management - Site selection - Types of housing - single row - double row system - head to head - tail to tail arrangement - merits and demerits. Floor space requirement for various categories of animals
10.	Outlines of Care and management of new born calves - importance of colostrum feeding - Composition of colostrums - quantity and feeding schedule of colostrum.
11.	Management of pregnant and lactating animals
12.	Care and Management of Work Bullocks
13.	Methods of milking - hand milking - full hand method & stripping - machine milking and its advantages
14.	Clean milk production - Importance - Operation
15.	Definition of Ration Fodder management of livestock farming - Importance of green fodder - Drought Feeding management- unconventional feed
16.	Foot and mouth disease, hemorrhagic septicemia and anthrax - symptoms - vaccination schedule for dairycattle
17.	Biosecurity management
18.	Prevention and control of Mastitis, metabolic diseases - Milk fever, Ketosis and Grass tetany - Mini metabolic profile testing - forecasting of Disease
19.	Identification of sheep breeds of Tamil Nadu - Ramnad white, Madras red, Coimbatore, Mecheri, Vembur Trichy black Chevaadu. Identification of Goat breeds - Salem black, Kanniadu, Kodi adu, Tellicherry and Jamunapari.

	Economic traits - Sheep and Goat
20.	Systems of rearing - extensive - semi intensive, intensive and tethering.
21.	Floor space requirement for young and adult - Types of Goat housing - conventional housing - Elevated platform - advantages and disadvantages
22.	Care and management of young and adult stocks
23.	Feeding management of Sheep and Goat - common tree fodders - unconventional Fodder and feed - grazing
24.	Prevention and control of diseases - PPR, Enterotoxaemia, blue tongue, Sheep pox, Orf and Anthrax - symptoms - vaccination schedule - External and internal parasites management
25.	Breeds of swine - Breed characters of large white Yorkshire - Housing management in pigs - floor space requirement for piglets, sow and boar
26.	Care and management of new born piglets - piglet anemia - creep feeding- Feeding management of sow and boar - swill feeding.
27.	Prevention and control of diseases - swine fever and foot and Mouth disease - Porcine Circo virus
28.	Introduction and Definition of broiler , layer and backyard poultry farming / Alternative poultry
29.	Housing systems - cage and deep litter system. Merits and demerits - litter management in broiler housing. Floor space for broiler and layer
30.	Care and management of broiler - brooding, feeding, lighting, housing and disease prevention and control measures
31.	Care and management of layer - brooding, feeding, lighting, housing and disease prevention and control measures
32.	Composition and formulation of ration - pre starter, starter and finisher for broilers: chick mash, grower mash and layer mash for layers
33.	Prevention and control of Ranikhet disease, E.coli and Coccidiosis. - Aflatoxin
34.	Farm records - Culling - Insurance of Livestock - Advantages

### Practical Syllabus

External parts of Cattle, Sheep, Goat and poultry / Methods of medication - Identification methods of livestock and poultry - Common restraining methods of cattle, sheep and goat and poultry - Demonstration of disbudding in calves and 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 and draught cattle - Identification of abnormality in quality of milk / visit of milk collection centers / processing plants /Visits of shandy - Identification of abnormality in quality of milk / visit of milk collection centers / processing plants / Visits of shandy - Calculation to find out requirement of farm yard

manure per unit land major crops - Collection of five feed ingredients from native place market and pot culture of one variety of fodder - Feed mixing - Visit of feed mill - Visit to livestock farm - Veterinary University Training and Research Centre / Farm records maintenance - Preparation of brooder house and chicks management - Identification of good layer and poor layer in poultry, Cut up parts of broiler - dressing percentage calculation - Price fixation - Calculation of FCR for broiler and layer - Demonstration of Beak trimming, delousing, deworming and vaccination of poultry - Visit to various livestock and poultry farm.

### Practical Schedule

Ex. No.	Content
1.	External parts of Cattle, Sheep, Goat and poultry / Methods of medication
2.	Identification methods of livestock and poultry
3.	Common restraining methods of cattle, sheep and goat and poultry
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 and draught cattle
8.	Identification of abnormality in milk / visit of milk collection centers / processing plants /Visits of shandy
9.	Calculation to find out requirement of farm yard manure per unit land major crops
10.	Collection of five feed ingredients from native local market and pot culture of one variety of fodder
11.	Feed mixing - Visit of feed mill
12.	Visit to livestock farm - Veterinary University Training and Research Centre / Farm records maintenance
13.	Preparation of brooder house and chicks management
14.	Identification of good layer and poor layer in poultry Cut up parts of broiler - dressing percentage calculation - Price fixation - Calculation of FCR for broiler and layer.
15.	Livestock farm machinery identification Demonstration of Beak trimming, delousing, deworming and vaccination of poultry
16.	Revision
17.	Final practical examination

## **AEC X 201 Agricultural Economics, Marketing and Finance 0+1**

### **Objective**

- To impart practical knowledge on basic aspects of agricultural economics including farm management, agricultural marketing and farm financial management

### **Practical Syllabus**

**Farm Management:** Discussion on land and water resources: land use pattern, operational holding, sources of irrigation and cropping pattern in Tamil Nadu. Estimation of cropping intensity and irrigation intensity. Visit to a TNAU / Govt. farm to understand farm layout, resource endowments (farm buildings, machineries, livestock's, irrigation facilities etc) present in the farm and to understand various records viz., DMS, Input Registers, Muster Roll, Stock Registers etc.; Preparation of an interview schedule to collect details on cultivation and marketing cost for annual and perennial crops from farmer; Visit to Farmers field to study the production and marketing problems and collection of farm level data. Depreciation: Methods and calculation of depreciation for farm asset. Estimation of cost of cultivation, income and cost of production for annual and perennial crops. Preparation of financial statements: income/cash flow and net-worth statements. Preparation of partial budget for a technology/modern variety.

**Market and market institutions:** Marketing channel for agricultural and horticultural crops and price spread estimation. Visit to a Farmer's market / Shandy / Wholesale agricultural market to study the marketing farm produce. Visit to study the role and functions of Regulated market and e-NAM. Visit to FCI / SWC / CWC. Guest Lecture / Visit to Agricultural / Horticulture produce Export firms. Visit to an Input Marketing firm to understand the marketing of inputs. Guest Lecture from the institution / Visit to Primary Agricultural Co-operative Society / Visit to a Commercial Bank / Regional Rural Bank/ NABARD. Revision of portions and preparation for examination

### **Course Outcome**

At the end of this course the students will be exposed to practical knowledge on farm management, and marketing of agricultural commodities and role and functions of various financial and marketing institutions.

### **References / Text Books**

- 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.
- Johl, S.S & Kapoor, T.R. 1973. Fundamentals of Farm Business Management. Kalyani Publishers. Ludhiana.

Subba Reddy, S and P. Raghu Ram. 2011. Agricultural Finance and Management.  
Oxford & IBH. New Delhi.

Acharya S.S. and N.L.Agarwal. 2002. Agricultural Marketing in India. Oxford and IBH  
Publishing Co. Pvt. Ltd. New Delhi.

### Practical Schedule

<b>Ex. No.</b>	<b>Content</b>
1.	Discussion on land and water resources: land use pattern, operational holding, sources of irrigation cropping pattern in Tamil Nadu. Estimation of cropping intensity and irrigation intensity.
2.	Visit to a TNAU/ Govt. farm to understand farm layout, resource endowments (farm buildings, machineries, livestock's, irrigation facilities etc) present in the farm and understand various records DMS, Input Registers, Muster Roll, Stock Registers etc
3.	Preparation of an interview schedule to collect details on production and marketing of annual and perennial crops from farmer
4.	Visit to Farmers field to study the production and marketing problems and collection of farm level data
5.	Depreciation: Methods and calculation of depreciation for farm assets
6.	Estimation of cost of cultivation, income and cost of production for annual and perennial crops
7.	Preparation of financial statements: income / cash flow and net-worth statements
8.	Preparation of partial budget for a technology / modern variety.
9.	Marketing channel for agricultural and horticultural crops and price spread estimation
10.	Visit to a Farmer's market / Shandy / Wholesale agricultural market to study the marketing of farm produce.
11.	Visit to study the role and functions of Regulated market and e-NAM
12.	Visit to FCI / SWC / CWC
13.	Guest Lecture / Visit to Agricultural / Horticulture produce Export firms
14.	Visit to an Input Marketing firm to understand the marketing of inputs
15.	Guest Lecture from the institution / Visit to Primary Agricultural Co-operative Society / Commercial Bank / Regional Rural Bank
16.	Revision of portions and preparation for examination
17.	Final practical examination

## **AEX X 201 Extension Methods for transfer of Agricultural technologies 0+1**

### **Objectives**

- To develop knowledge on extension methods, e - Extension, social media techniques, rural institutions and adoption of technologies.
- To impart the skill to the students on extension methods, PRA tools - Social mapping, Resource mapping, transect walk, Seasonal calendar and Venn diagram, social media techniques, Preparation of interview schedule to assess the spread and acceptance of crop varieties and technologies released from Tamil Nadu Agricultural University.

### **Practical Syllabus**

- Study on extension methods and the characteristics of extension worker. Practicing art of Public Speaking. Organizing and conducting Method and Result Demonstrations; trainings, meetings, campaigns, Exhibition and Farmers mela. Preparation of Leaflets, Folders, Poster, Charts and Pamphlets - Both digital and conventional mode, Organizing Front Line Demonstration (FLD), On Farm Trial (OFT), Multi Location Trial (MLT) and Adaptive Research Trial (ART).
- Studying the organizational structure and functions of ADA / ADH. Studying the structure and functions of Krishi Vigyan Kendra. Exposure to various modes of presentation through Radio and Visit to local media channels to understand its' functions in technology transfer.
- Studying the contents and usage of Uzhavan App, Kisan Suvidha / Mobile Apps. Study on social Institutions - Panchayat, Self Help Groups and Farmers' Organizations.
- Practicing PRA Techniques - Social mapping, Resource mapping, Transect walk, Seasonal calendar and Venn diagram. Preparation of different data collection tools - observation, questionnaire, interview schedule. Interaction with farmers to study the adoption of TNAU released technologies.

### **Course Outcome**

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

### **References/ TextBooks**

- Adivi Reddy A. 1971. Extension Education. Sree Lakshmi Press, Bapatla, Andhra Pradesh.
- Dahama OP & Bhatnagar OP. 2005. Education and Communication for Development. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Ray, G.L. 2006. Extension Communication and Management, Naya Prakash Publications, Kolkata.

P. M. Khan, and L.L.Somani. 2012. Fundamentals of Extension Education, Agrotech Publishing Academy. Udaipur.  
[www.agritech.tnau.ac.in](http://www.agritech.tnau.ac.in)

### Practical Schedule

Ex. No.	Content
1.	Studying different extension methods for technology transfer
2.	Studying the qualities of extension worker and Practicing art of Public Speaking.
3.	Organizing and conducting Method and Result Demonstrations at Village Setting
4.	Organizing and conducting trainings, meetings, campaigns, exhibition and farmers mela at Village Setting.
5.	Preparation of Leaflets, Folders and Poster - Both digital and conventional mode
6.	Preparation of Charts and Pamphlets - Both digital and conventional mode
7.	Organizing Front Line Demonstration (FLD), On Farm Trial (OFT), Multi Location Trial (MLT) and Adaptive Research Trial (ART)
8.	Studying the organizational structure and functions of ADA / ADH
9.	Studying the structure and functions of Krishi Vigyan Kendra.
10.	Exposure to various modes of presentation through Radio and Visit to local media channels to understand its' functions in technology transfer
11.	Studying the contents and usage of Uzhavan App, Kisan Suvidha / Mobile Apps.
12.	Study on social Institutions - Panchayat, Self Help Groups and Farmers' Organizations
13.	Practicing PRA Techniques - Social mapping, Resource mapping, Transect walk, Seasonal calendar and Venn diagram
14.	Preparation of different data collection tools - observation, questionnaire and interview schedule.
15.	Interaction with farmers to study the adoption of TNAU released technologies.
16.	Revision
17.	Final practical examination

**CAG A 202 Commercial Agriculture II 0+2**  
**Commercial Bee keeping**

**Objective**

To promote students as entrepreneurs in beekeeping by enriching them with knowledge on honeybee species, apiary management, production of honey, beeswax and other byproducts

**Practical Syllabus**

Collection of bee species and general study - Understanding the economic importance of different bee species and their role in crop pollination; Bee products - honey, bees wax, bee pollen, propolis, bee venom and royal jelly - Identification of bee castes - Biology of bee species Hives and hive construction - Adaptations, communication and behaviour in honey bees- Identification of bee pasturage - Preparation of bee floral calendar- Site selection and establishment of an apiary; Bee keeping Appliances - Hiving of Indian bee feral colonies - Colony management practices - Management of bee colonies for honey Production - Management of bee colonies during honey Production season- lean season - Management of bee colonies for honey Production - Diagnosis and management of bee enemies diseases and poisoning- Introduction to meliponi culture - Quality testing and assurance - Value addition of honey and wax - Economics of bee keeping - Project preparation

**Reference**

Ghosh, G. K. (1994). Beekeeping in India. Asish Publishing House, New Delhi.  
Atuar Rahman, 2017. Apiculture in India. Published by ICAR, New Delhi. ISBN: 978-81-7164-165-9.

**Practical Schedule**

<b>Ex. No.</b>	<b>Content</b>
1.	Collection of bee species and general study Honey bee species, castes, social biology and communication in honey bees
2.	Understanding the economic importance of different bee species Different species of bees and their role in crop pollination
3.	Bee products - honey, bees wax, bee pollen, propolis, bee venom and royal jelly
4.	Identification of bee castes - Queen, drone and worker
5.	Biology of bee species - Developmental period and longevity of each caste
6.	Hives and hive construction - Different types of hives, hexagonal cells
7.	Hive inspection - Time and methods of inspection
8.	Adaptations, communication and behaviour in honey bees

9.	Identification of bee pasturage - floral plants, pollen and nectar providing plants
10.	Preparation of bee floral calendar - Month wise availability of flora in a particular location - Honey bees for crop pollination and seed production - Stingless bees, little bees, rock bees conservation and honey harvest
11.	Site selection and establishment of an apiary
12.	Bee keeping Appliances - Beehives, beekeeping equipments, specification and uses
13.	Hiving of Indian bee feral colonies - Do's and Don'ts,
14.	Colony management practices - management during honey flow season - swarm management
15.	Colony management practices - management during honey flow season - Dividing, Supering, providing CFS
16.	Management of colonies during lean season - practicing sugar solution feeding
17.	Management of colonies during lean season - practicing pollen supplement preparation
18.	Management of colonies during lean season - practicing uniting of weak colonies, management of absconding and laying workers
19.	Management of bee colonies for honey Production - Colony strengthening
20.	Management of bee colonies for honey Production - Queen replacing
21.	Diagnosis and management of bee enemies - Insect and non insect enemies
22.	Diagnosis and management of bee diseases - Thai Sac Brood Virus
23.	Diagnosis and management of bee diseases - other diseases
24.	Diagnosis and management of bee poisoning - Insecticides - safety measures - protecting bees from pesticides
25.	Introduction to meliponi culture
26.	Quality testing and assurance
27.	Value addition of honey - Flavored honey, honey based candy etc.
28.	Value addition of wax - Candle, craft items and skin cream making
29.	Economics of bee keeping
30.	Marketing and economics of honey and bee products
31.	Project preparation - preparation of bee keeping projects for bank funding
32.	Visit to commercial bee keeping unit
33.	Revision class
34.	Final practical examination

## CAG A 202 Commercial Agriculture II 0+2 Biofertilizer Production

### 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*, *Glucanoacetobacterdiazotrophicus*, 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*, *Glucanoacetobacterdiazotrophicus*, 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*, *Glucanoacetobacterdiazotrophicus*, 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.

## 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

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

## Practical Schedule

Ex. No.	Content
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 - <i>Rhizobium</i> , <i>Azospirillum</i> and <i>Azotobacter</i>
6.	Production of various bacterial biofertilizers in large scale <i>Rhizobium</i> , <i>Azospirillum</i> and <i>Azotobacter</i>
7.	Production of various bacterial biofertilizers in laboratory scale- <i>Glucanoacetobacter diazotrophicus</i> , phosphate, solublisers, zinc solublisers, potash releasers and PGPR
8.	Production of various bacterial biofertilizers in large scale - <i>Glucanoacetobacter diazotrophicus</i> , 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.	Problems and Constraints in mass production of various biofertilizers

18.	Quality control - BIS /FCO standards for <i>Rhizobium</i> , <i>Azospirillum</i> , <i>Azotobacter</i> and <i>Gluconoacetobacter</i> .
19.	Quality control- BIS /FCO standards for phosphate solublizers, potash releasers and AM fungi
20.	Visit to biofertilizer production unit
21.	Application techniques– form, dose method and time of application of biofertilisers – <i>Rhizobium</i> , <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Glucanoacetobacterdiazotrophicus</i> , phosphate solublisers and potash releasers .
22.	Application techniques– form, dose method and time of application of biofertilisersAzolla, BGA, AM fungi, PPFM and PGPR
23 - 24	Evaluation of plant response to various biofertilizer application- <i>Rhizobium</i> , <i>Azospirillum</i> , <i>Azotobacter</i>
25- 26	Evaluation of plant response to various biofertilizer application- phosphorus solubilizer, potash releaser
27- 28	Evaluation of plant response to various biofertilizer application Azolla, BGA, AM fungi, PPFM and PGPR.
29	Visit to biofertilizer inoculated field – Farmers field and interaction with farmers
30.	Requirements for establishment of biofertilizer production unit- Economics
31.	Economics of biofertilizer usage - B:C ratio
32.	Project preparation of biofertilizer production
33.	Revision
34.	Final practical examination

**CAG A 202 Commercial Agriculture II 0+2**  
**Commercial Floriculture and Ornamental Gardening**

**Objective**

To impart knowledge and practical skills on concepts and production practices of flower, experiential learning pathways in commercial landscape gardening

**Practical Syllabus**

Study on cultural requirements of commercial flower crops Jasmine, Rose, Chrysanthemum, Marigold, Tuberose, Crossandra, Cockscomb, Ornamental gardening - Formal and informal gardens - Components of garden - lawns and lawn making - study of important flowering annuals, flowering and foliage shrubs - flowering and foliage trees - creepers and climbers cacti and succulents - palms and cycads - Indoor plants - cut flowers - Flower arrangement- Bonsai culture, dry flower making.

Preparing ornamental garden design for home - Practices in lawn making; different methods of lawn making - Identification of important annuals, herbaceous perennials, shrubs' trees, cacti and succulents, creepers and climbers, bulbous plants and hedge plants - Preparation of pot mixture - potting and reporting practices in raising nursery for ornamental plants - Interior decoration - Visit to commercial flower fields, botanical gardens and horticultural shows.

**References**

Bose.T.K, R.G. Maiti, R.S. Dhua and P.Das. 1999. Floriculture and Landscaping. Naya prakash, Calcutta.

Booth. N.K. 1983. Basic elements of landscape architectural design.

Randhawa, G.S. and A. Mukhopadhyay, 2001. Floriculture in India. Allied Publishers Limited, New Delhi.

TNAU Agritech Portal

**Practical schedule**

<b>Ex. No.</b>	<b>Content</b>
1.	Study on cultural practices in jasmine
2.	Study on cultural practices in rose
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 garden types - formal and informal gardens
7.	Study on components of a garden
8.	Practices in identification of lawn grasses
9.	Study on important flowering annuals

10.	Study on important flowering and foliage shrubs
11.	Study on important flowering and foliage trees
12.	Study on important creepers and climbers
13.	Study on important cacti and succulents
14.	Study on important palms and cycads
15.	Study on indoor plants and its utility
16.	Practices in flower arrangement with cut flowers and fillers
17.	Practices in different methods of lawn making
18.	Practices in lawn management
19.	Study on bonsai culture
20.	Study on dry flower making
21.	Preparing garden design for ornamental home garden
22.	Identification of important annuals and herbaceous perennials for ornamental gardening
23.	Identification important shrubs and hedges for ornamental gardening
24.	Identification of important trees for ornamental gardening
25.	Identification of important cacti, succulents, creepers and climbers for ornamental gardening.
26.	Identification of important bulbous plants for ornamental gardening
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.	Practices in interior decoration with house plants
31.	Visit to commercial flower fields
32.	Visit to botanical garden
33.	Revision
34.	Final practical examination

**CAG A 202 Commercial Agriculture II 0+2**  
**Commercial mushroom production**

**Objective**

The students will be exposed to commercial aspects of mushroom production and processing so as to start their own mushroom enterprise.

**Practical Syllabus**

Different types of mushroom, - Edible and poisonous type - edible mushrooms- *Pleurotus* and *Calocybe* – preparation of culture media- pure culture techniques-sterilizing techniques-media - glassware - maintenance of culture - Mother spawn production-Multiplication of bed spawn – Substrates -mushroom cultivation techniques for *Pleurotus* and *Calocybe*. - Maintenance of spawn running and cropping room-harvest-packing and storage of *Pleurotus* and *Calocybe*. - Project preparation for *Pleurotus* and *Calocybe* - Problems in cultivation of *Pleurotus* and *Calocybe* – pests, diseases, abiotic disorders -Post harvest technology of *Pleurotus*, *Calocybe*– methods of preservation – Packing methods and storage-*Pleurotus* and *Calocybe*- Recipe making and value added products

**Outcome**

- The students will learn about the mushroom production techniques in such a way that they can start their own enterprise.

**Reference**

Krishnamoorthy, A.S., Marimuthu, T., and S. Nakkeran. 2005. Mushroom Biotechnology, Vijay Books. Sivakasi, India., Pub.ODL, TNAU, Cbe-3  
Mushroom Cultivation in India - 2007 by B C (Author), Suman (Author), V P Sharma (Author)

**Practical schedule**

<b>Ex. No.</b>	<b>Content</b>
1.	Identification of edible ( <i>Pleurotus</i> , <i>Agaricus</i> , <i>Volvariella</i> and <i>Calocybe</i> ) and poisonous mushrooms
2.	Equipment required for culture media preparation, spawn preparation and substrate sterilization - their operation
3.	Preparation of Potato Dextrose Agar ( PDA) medium and Oat Meal Agar Medium
4.	Sterilization of Media
5.	Pure culture technique –Tissue isolation methodology- Oyster

6.	Oyster - Sub culturing of fungal cultures and maintenance.
7.	Oyster mushroom: substrate preparation for mother spawn
8.	Oyster mushroom: mother spawn inoculation
9.	Oyster mushroom: first generation and second-generation bed spawn preparation
10.	Oyster mushroom: Bed spawn inoculation and Management of contaminants in mother spawn and bed spawn
11.	Oyster mushroom cultivation – essentials required, cropping room requirement, preparation of substrates for bed preparation, harvest and storing
12.	Oyster mushroom – Insects, Disease and abiotic disorders their management
13.	Project preparation for oyster mushroom
14.	Visit to oyster mushroom farm
15.	Pure culture technique –Tissue isolation methodology- Milkymushroom
16.	Sub culturing of fungal cultures and maintenance- Milky mushroom
17.	Milky mushroom: mother spawn substrate preparation
18.	Milky mushroom: mother spawn inoculation
19.	Milky mushroom: first generation and second generation bed spawn preparation
20.	Milky mushroom: Bed spawn inoculation and Management of contaminants in mother spawn and bed spawn
21.	Milky mushroom cultivation – essentials required, cropping room requirement, preparation of substrates for bed preparation, harvest and storing
22.	Milky mushroom – Insects, Disease and abiotic disorders their management
23.	Project preparation for Milky mushroom
24.	Visit to Milky mushroom farm
25.	Biodegradation of agrowastes using mushroom spawn
26.	Mushroom as a component in Integrated Farming System
27.	Short term post-harvest processing of Milky and oyster mushroom
28.	Long term post-harvest processing of Milky and oyster mushroom
29.	Packing and storage methods of Milky mushrooms
30.	Packing and storage methods of oyster mushrooms
31.	Recipe and value added products from oyster mushroom
32.	Recipe and value added products from Milky mushroom
33.	Revision
34.	Final practical examination

## **AEX A 201 Exposure Visit 0+1**

### **Objective**

This programme will be conducted for seven days as prescribed by the syllabus. The students will be placed in the Research Stations / Krishi Vigyan Kendra's to expose practical field experience.

### **Duration : 7 days**

#### **Unit I: Visit to Research Stations**

- Study the organizational structure; varieties and technologies released and schemes implemented by the research station
- Study of On Farm Trails and seed production activities, linkage with Department of Agriculture and Allied Sectors.
- Studying farm management along with the registers to be maintained.
- Studying the procedures of data collection from research plots and maintenance of field note/ diary.

#### **Unit II: Visit to State Seed Farm**

- Understanding the seed production techniques - breeder seeds, foundation seeds, certified seeds by visiting fields.
- Studying the process of seed storage, processing, grading, packaging and distribution.
- Linkage with seed industries and allied departments.

#### **Unit III: Visit to State Horticultural Farm**

- Understanding the different propagative material production techniques - grafting, layering; different pruning practices, vegetable seed production techniques - breeder seeds, foundation seeds, certified seeds.
- Studying nursery maintenance and protected cultivation of high value crops
- Visit to Agro Industries to understand the history of firm and nature of business.
- Studying production management, input and labour management, marketing management and financial management.
- Learning how to prepare a viable project based on the field experience.