

**DEPT. OF
HORTICULTURE**

LIST OF NEW COURSES

S.No.	Course Code	Name of the Course	Credits
1	18HO2012	Study Tour – I	0:0:1
2	18HO2013	Principles of Ornamental Horticulture and Landscape Architecture	2:0:1
3	18HO2014	Dryland Horticulture	2:0:1
4	18HO2015	Breeding of Fruits and Plantation Crops	2:0:1
5	18HO2016	Seed Production of Vegetable, Tuber and Spice Crops	2:0:1
6	18HO2017	Insect Pests of Vegetable, Ornamental and Spice Crops	2:0:1
7	18HO2018	Introduction to Major Field Crops	1:0:1
8	18HO2019	Economics and Marketing	2:0:1
9	18HO2020	Horti-Business Management	2:0:0
10	18HO2021	Post-harvest Management and Processing of Horticultural Crops	2:0:2
11	18HO2022	Breeding and Seed Production of Flower and Ornamental Plants	2:0:1
12	18HO2023	Nematode Pests of Horticultural Crops and their Management	1:0:1
13	18HO2024	Apiculture, Sericulture and Lac Culture	1:0:1
14	18HO2025	Study tour - II	0:0:1

18HO2012 STUDY TOUR – I

Credits 0:0:1

Course Objectives

- To be familiar with various horticultural institutions/ Research Stations/ Colleges in South India
- To be familiar with the ongoing horticultural research and extension programmes in various Horticultural Institutions/ Colleges of South India

Course Outcome

At the end of this course, the students will be able to

- Gain practical knowledge about horticultural crops and cropping systems in the different agro-climatic zones and horticultural crops in Tamil Nadu
- Learn social, cultural aspects of different agricultural zones in TamilNadu
- Identify and analyze different soil types and cropping systems for horticultural crops in Tamil Nadu

Course Content:

The study tour programme is of one week, during this period various Agricultural Research Stations, Institutions or Colleges will be visited. This is to get an exposure of various ongoing research and extension activities in different agro- eco systems in the State.

Evaluation and mark distribution

In the study tour programme, full attendance is mandatory for a pass as per the ICAR regulations.

The marks awarded as follows for the evaluation of the courses

Attendance and general behaviour	- 35
Report of the study tour	- 35
Exam (internal)	- 20
Viva	- 10
Total	- 100

18HO2013 PRINCIPLES OF ORNAMENTAL HORTICULTURE AND LANDSCAPE ARCHITECTURE

Credits 2:0:1

Course Objective

- To define scope and importance of ornamental horticulture and landscaping
- To familiarize with the different styles and designs of landscape architecture
- To learn about suitability of ornamental crops for different areas, cut flowers and floral arrangements
- To be able to use AutoCAD and ArchCAD for gardening and landscape designing

Course Outcome

At the end of this course, the students will be able to

- Remember the principles of landscape design
- Explain about the different ornamental crops and its landscape uses
- Develop knowledge about the crops suitable to different landscapes
- Discover different landscaping designs and architectures

Theory

History, definitions, scope, Importance, area and production, industrial importance of ornamental plants and flowers. Importance, classification, design values of ornamentals. Principles of Landscape gardens. Historical Importance of Indian gardens(English garden , Japanese gardens , Mughal, gardens, French and Persian garden, Italian gardens, Hindu gardens and Buddhist gardens), Famous gardens of India and abroad, formal, informal, free style and wild gardens. Importance, design and establishment of garden features, bridges, paths, drives, fences, garden walls, gates, carpet bed, arbour, Patio, decking, retainingwalls, shade garden, sunken garden, roof garden, terrace garden, pebble garden, rockery, pools,waterfalls, fountains, bog garden, avenue planting and children garden. Lawn types, establishmentand maintenance. Importance of flower arrangement, Ikebana techniques and types, uses of vertical garden, bottle garden, terrariums, xeriscaping, bonsai making and maintenance. Use of Auto CAD and Arch CAD in designing gardens. Factors affecting landscape design. Bio-aesthetic planning. Planning and designing of different gardens.

Practical

Identification and description of annuals, biennials, herbaceous perennials, climbers, shrubs, trees, indoor plants, ferns. Palms, cycads, Cacti and succulents. Planning and designing and establishment of garden features viz. lawn, hedge, edge, rockery, water garden, carpet bedding, shade garden, roof garden, terrariums, verticalgarden, study and practice of different types of flower arrangements, floral bouquets, floral rangoli, veni etc., Study of Bonsai techniques, Bonsai practicing and training.Visit to nurseries and floriculture units. Study of garden equipments and designing of different styles of garden. Designing gardens using Auto-cad/archi-cad, Designing gardens for home, traffic islands, schools and colleges, public buildings, factories, railway stations, air ports, temples, churches, play grounds, corporate buildings/ malls. Visit to public, institutional and botanical gardens.

References:

1. De. L.C.Nursery and landscaping.2013. Pointer publishers, Jaipur India.
2. Grewal H.S and Parminder Singh. 2014. Landscape designing and ornamental plants
3. Peter. K.V.2009.Ornamental plants. New India publishing agency, Pitampura, New Delhi.
4. Rajesh Srivastava. 2014. Fundamentals of Garden designing. Agrotech press, Jaipur, New Delhi.
5. Richard Bird. 2002. Flowering trees and shrubs. Printed in Singapore by Star Standard Industries pvt. Ltd.
6. Roy R.K. Fundamentals of Garden designing.2013.New India publishing agency, Pitampura, New Delhi.
7. Tiwari A.K and R. Kumar. 2012. Fundamentals of ornamental horticulture and landscape gardening. New India.

18HO2014 DRYLAND HORTICULTURE

Credits: 2:0:1

Course Objectives

- To learn about techniques and management of dryland horticulture
- To learn about the various water conservation methods
- To learn about horticultural crops adapted for dryland cultivation and special cultivation techniques

Course Outcome

At the end of this course, the students will be able to

- Remember the present day water availability scenario
- Explain different water conservation techniques
- Gain knowledge on different crops suitable to dryland areas
- Identify different dryland farming techniques

Theory

Definition, importance and limitation of dry land horticulture, present status and future scope. Constraints encountered in dry lands. Agro-climatic features in rain shadow areas, scarce water resources, high temperature, soil erosion, run-off losses etc. Techniques and management of dry land horticulture. watershed development, soil and water conservation methods-terraces, contour bunds, etc. Methods of control and impounding of run-off water-farm ponds, trenches, macro catch pits, etc., *in-situ* water harvesting methods, micro catchment, different types of tree basins etc. Methods of reducing evapotranspiration, use of shelter belts, mulches, antitranspirants, growth regulators, etc. water use efficiency-need based, economic and conjunctive use of water, micro systems of irrigation etc. Selection of plants having drought resistance. Special techniques, planting and after care-use of seedling races, root stocks, *in-situ* grafting, deep pitting/planting, canopy management etc. Characters and special adaptation of crops: ber, aonla, annona, jamun, wood apple, bael, pomegranate, carissa, date palm, phalsa, fig, west Indian cherry and tamarind.

Practical

Study of rainfall patterns. Contour bunding/trenching, micro catchments, soil erosion and its control. Study of evapotranspiration, mulches and micro irrigation systems. Special techniques of planting and aftercare in dry lands. Study of morphological and anatomical features of drought tolerant fruit crops.

References

1. Awasthi O.P., P.L. Saroj. 2008. Advances in Arid Horticulture. Production Technology of Arid and Semi-arid Fruits. International Book Distributing Co.
2. Chundawat, B.S. 1990. Arid Fruit Culture. Oxford and IBH, New Delhi.
3. Pradeep Kumar, T., B. Suma, Jyothi Bhaskar and K.N.Sathesan. 2008. Management of Horticultural Crops. New India Publishing Agency.
4. Sivamurugan, A.P., R. Arun Kumar. 2008. Dryland Horticulture. Kalyani Publishers.
5. Taroj, P.L., B.B. Vashishtha, D.G.Dhandar. 2004. Advances in Arid Horticulture. Internal Book Distributing Co., Lucknow.

18HO2015 BREEDING OF FRUITS AND PLANTATION CROPS

Credits 2:0:1

Course Objectives

- To learn about fruit breeding and its importance in fruit production
- To be familiar with the various fruit crop improvement strategies
- To understand the breeding methods of important fruit and plantation crops

Course Outcome

At the end of this course, the students will be able to

- Remember the different breeding aspects in important fruit and plantation crops
- Explain about the different crop improvement strategies
- Develop knowledge about breeding methodologies of important fruit and plantation crops

Theory

Fruit breeding - History, importance in fruit production, distribution, domestication and adaptation of commercially important fruits, variability for economic traits, breeding strategies, clonal selection, bud mutations, mutagenesis and its application in crop improvement – policy manipulations – *in vitro* breeding tools (important fruit and plantation crops).

Practical

Exercises on floral biology, pollen viability; emasculation and pollination procedures; hybrid seed germination; raising and evaluation of segregating populations; use of mutagens to induce mutations and polyploidy in major crops like Mango, Banana, Citrus, Grapes, Guava, Sapota, Papaya, Custard apple, Aonla, Ber, Litchi, Pomegranate, Jamun, Arecanut, Coconut, Pistachnut, Apple, Pear, Plum, Peach, Apricot and Strawberry.

Reference:

1. Anil Kumar Shukla 2004. Fruit breeding approaches & Achievements. International Book Distributing Co.
2. Kumar N. 2015. Breeding of Horticultural Crops: Principles and Practices 2nd Revised & Expanded Ed. New India Publishing Agency.
3. Ramachandra R.K., Maheshwar D.L., Shoba N. 2016. Breeding Of Spice & Plantation. Jaya Publishing House.
4. Gyana Root, Peter K.V. 2018. Genetic Engineering of Horticultural Crops. Academic Press. Elsevier. US.

18HO2016 SEED PRODUCTION OF VEGETABLE, TUBER AND SPICE CROPS

Credits 2:0:1

Course Objectives

- To learn about the history and growth of seed industry in India
- To learn about the various seed production techniques of important vegetable, tuber and spice crops
- To be familiar with the seed legislative laws in India

Course Outcome

At the end of this course, the students will be able to

- Remember the different seed production techniques
- Understand the different seed legislative laws
- Develop knowledge about the seed production techniques in important vegetable, tuber and spice crops

Theory

Introduction and history of seed industry in India. Definition of seed, classes-types of seed. Differences between grain and seed. Importance and scope of vegetable seed production in India. Principles of vegetable seed production. Role of temperature, humidity and light in vegetable seed production, land requirements, climate, season, planting time, nursery management, seed rate, rouging, seed extraction and storage of cole crops, root vegetables, solanaceous vegetables, cucurbits, okra, leafy vegetables, bulb crops, leguminous vegetables and exotic vegetables. Seed germination and purity analysis. Field and seed standards. Seed drying and extraction. Seed legislation.

Practical

Study of seed structure, colour size, shape and texture. Field inspection of seed crops. Practices in rouging. Harvesting and seed extraction. Germination and purity analysis. Methods of seed production, Seed certification in cole crops, root vegetables, bulb crops, solanaceous vegetables, cucurbits, okra, leafy

vegetables, leguminous vegetables and exotic vegetables. Seed processing machines. Visit to seed production units.

References:

1. Agarwal, P. K. 2010. Techniques in Seed Science and Technology. South Asian Publishers. New Delhi.
2. Arya, Prem Singh. 2003. Vegetable seed Production Principles. Kalyani Publishers. Ludhiana.
3. Fageria, M. S. 2011. Vegetable Crops- Breeding and Seed Production. Kalyani Publishers. Ludhiana.
4. Geetharani, P. 2007. Seed Technology in Horticultural Crops. NPH Publications. Jodhpur.
5. Hazra P. and Som M.G., 2009. Vegetable seed production and Hybrid Technology. Kalyani Publishers, Ludhiana.
6. Prem Singh Arya, 2003. Vegetable breeding, production and seed production. Kalyani publishers, New Delhi.
7. Singh, Prabhakar.2015.Seed Production Technology of vegetable. Daya Publishing House. New Delhi.
8. Singh, S.P. 2001. 1st edition, *Seed production of commercial vegetables*. Agrotech Publishing, Udaipur
9. Vanangamudi, K.2010. Vegetable Hybrid Seed Production and Management. Agrobios. Jodhpur.
10. Peter K.V. 2012 Handbook of Herbs & Spices. Woodhead Publishing. Elsevier. Cambridge. UK.

18HO2017 INSECT PESTS OF VEGETABLE, ORNAMENTAL AND SPICE CROPS

Credits 2:0:1

Course Objectives

- To learn about the insect pests of vegetable, ornamental and spice crops
- To study the ecology and integrated pest management strategies of important vegetable, ornamental and spice crops
- To assess damage, insecticidal residue, and tolerance limits of chemical pesticides in vegetable crops

Course Outcome

At the end of this course, the students will be able to

- Remember the major insect pests of vegetable, ornamental and spice crops
- Identify the different storage pests and their management
- Gain knowledge in Integrated Pest Management techniques of vegetable, ornamental and spice crops

Theory: Economic importance of insects in vegetable, ornamental and spice crops -ecology and pest management with reference to these crops. Pest surveillance in important vegetable, ornamental and spice crops. Distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting vegetable, ornamental and spice crops. Important storage insect pests of vegetable, ornamental and spice crops, their host range, bio-ecology, injury and integrated management. Insect –pests of processed vegetables and ornamental crops, their host range, bioecology, injury and integrated management. Insecticidal residue problems in vegetables and ornamental crops, tolerance limits etc.

Practical

Study of symptoms, damage, collection, identification, preservation, assessment of damage/ population of important insect-pests affecting vegetable, ornamental and spice crops in field and during storage.

References:

1. Emmanuel, N, A. Sujatha, T.S.K. K. Kiran Patro, MLN Reddy, B. Srinivasulu, TSSK Samuel Patro. 2015. Text Book on Integrated Pest Management of Horticultural Crops Astral International Publishers, New Delhi.

2. Dhalinal G.S. and Ramesh Arora Integrated Pest Management Concept and Approaches. Kalyani Publishers, Ludhiana
3. Reddy, P. P., 2010. Plant Protection in Horticulture Vol. 1, 2 & 3, Scientific Publishers, Jodhpur
4. Ranjit, P., 2012. Entomological Techniques in Horticultural Crops, New India Publishing Agency.
5. Srivastava.A. 2016. Text Book on Applied Entomology Vol. I&II. , Kalyani Publishers, Ludhiyana

18HO2018 INTRODUCTION TO MAJOR FIELD CROPS

Credits 1:0:1

Course Objectives

- To learn about classification and distribution of field crops
- To learn about the various cropping systems and cultivation practices of major field crops
- To be familiar with fertilizer and herbicide application methods

Course Outcome

At the end of this course, the students will be able to

- Remember classification and distribution of major field crops
- Define and explain the concepts of multiple cropping, mixed cropping, intercropping, relay and alley cropping
- Gain knowledge about major field crops and cropping systems

Theory

Classification and distribution of field crops, definitions and concept of multiple cropping, mixed cropping, intercropping, relay and alley cropping, cultural practices for raising major cereals (rice), pulses (red gram), oil seeds (groundnut), sugar crops (sugarcane) and fodder crops, green manuring, crop rotation.

Practical

Identification of crop plants, seeds and weeds. Preparation of cropping scheme. Application of herbicides in field crops.

References:

1. Gurarajan. B., R.Balasubramanian and V.Swaminathan. 2008. Recent Strategies on Crop Production. Kalyani Publishers, New Delhi.
2. Rajendra Prasad 2002. Text Book of Field crops Production,ICAR, New Delhi.
3. Reddy. S.R. 2009. Agronomy of Field Crops. Kalyani Publishers, New Delhi.
4. Singh. S.S. 2005. Crop Management. Kalyani Publishers, New Delhi. UAS, Bangalore. 2011.
5. Subhash Chandra Bose, M. and Balakrishnan, V. 2001. Forage Production South Asian Publishers, New Delhi. 2018.
6. Peter K.V. 2018. Zero hunger in India: Policies and Perspectives. Brillion Publishing.

18HO2019 ECONOMICS AND MARKETING

Credits: 2:0:1

Course Objectives

- To understand the concept of agricultural market structure and its classification
- To study the theories of demand and supply of agricultural produce in market-oriented economy
- To be familiar with marketing of agricultural produce and to prepare projects individually

Course Outcome

At the end of this course, the students will be able to

- Recall the concepts of agricultural marketing
- Understand about marketing margin and marketing functions
- Plan for proposing individual project in cost effective manner

Theory

Terms and definitions in Economics; Consumption, demand and supply. Factors affecting production. Gross Domestic Product (GDP) – Role of **poultry** sector in National GDP. Marketing- Definition, marketing process, need for marketing, role of marketing, marketing functions, classification of markets, marketing of various channels, price spread, marketing efficiency, integration, constraints in marketing of agricultural produce, market intelligence, bank norms, insurance, SWOT analysis, crisis management. Techno-economic parameters for preparation of projects and basic guidelines for preparation of project report.

Practical

Techno-economic parameters for preparation of project. Preparation of bankable projects for various agricultural products and its value-added products. Identification of marketing channel, calculation of price spread, identification of market structure and visit to different markets.

References

1. Philip, K. 2004. Marketing Management. Prentice Hall, New Delhi.
2. Philip, K. 2004. Principles of Marketing. Prentice Hall, New Delhi.
3. Dewett, K.K. 2005. Modern Economic Theory. S. Chand, New Delhi.
4. Dewett, K.K., Verma. 2004 Elementary Economic Theory, S.Chand, New Delhi
5. Jhingam, M.L. 2001. Micro Economic Theory. Konark publishers, New Delhi
6. Subba Reddy. S. Raghu Ram. P. Neela Kanta Sastry. T.V. Bhavani Devi. I. Agricultural Economics (2nd Edn.). 2008
7. Acharya. S.S. Agricultural Marketing in India (7th Edn.). 2019.

18HO2020 HORTI-BUSINESS MANAGEMENT

Credits: 2:0:0

Course Objectives

- To learn about farm and business management principles
- To study the concepts of economics, materials and operations management, inventory control and marketing management
- To learn about financial management, budgeting, and project management

Course Outcome

At the end of this course, the students will be able to

- Recall farm and business management concepts
- Understand forms of business management, operations and materials management, financial management, personnel management, and inventory control,
- Gain knowledge on planning marketing programmes, preparing financial statements, budgeting and project management

Theory

Farm management - definition, nature, characteristics and scope. Farm management principles and decision making, production function, technical relationships, cost concepts, curves and functions – factors, product, relationship – factors relationship, product relationship, optimum conditions, principles of opportunity cost-equi-marginal returns and comparative advantages, time value of money, economic of scale, returns to scale, cost of cultivation and production, break even analysis, decision making under risk and uncertainty. Farming systems and types. Planning – meaning, steps and methods of planning, types of plan, characteristics of effective plans. Organizations – forms of business organizations, organizational principles, division of labour. Unity of command, scalar pattern, job design, span of control responsibility, power authority and accountability. Direction – guiding, leading, motivating, supervising, coordination – meaning, types and methods of controlling – evaluation, control systems and devices. Budgeting as a tool for planning and control. Record keeping as a tool of control. Functional areas of management – operations management – physical facilities, implementing the plan, scheduling the work,

controlling production in terms of quantity and quality. Materials management – types of inventories, inventory costs, managing the inventories, economic order quantity (EOQ). Personnel management – recruitment, selection and training, job specialization. Marketing management – definitions, planning the marketing programmes, marketing mix and four P's. Financial management – financial statements and ratios, capital budgeting. Project management – project preparation evaluation measures.

Suggested Reading

1. Heady Earl O and Herald R. Jenson, 1954, Farm Management Economics. Prentice Hall, New Delhi
2. S.S. Johl, J.R. Kapur, 2006, Fundamentals of Farm Business Management. Kalyani Publishers, New Delhi
3. Karan Singh and Kahlon A S. Economics of Farm Management in India. Theory and Practice. New Delhi.
4. Allied L.M. Prasad. 2001. Principles and Practices of Management, 9th Ed. S. Chand & Sons, New Delhi.
5. Koontz Harold. Principles of Management. Tata McGraw-Hill Education Private Limited, New Delhi.
6. P.C. Thomas. Managerial Economics, 9th Ed. Kalyani Publishers.
7. K.K. Dewett and M.H. Navalur. Modern Economic Theory. S. Chand & Sons, New Delhi.
8. P. Subba Rao. Human Resource Management. Himalaya Publications.
9. S.P. Jain. Financial Accounting. Kalyani Publications, Ludhiana.
10. Shapiro E. Macroeconomic analysis. Galgotia Publications Delhi
11. Barry P J, Hopkins J A and Baker C B. Financial Management in Agriculture, 6th ed. Danville, IL Interstate Publishers.
12. Gittiner, J P., 1982. Economic analysis of agricultural projects. The John Hopkins University Press Baltimore, USA,
13. Benjamin Mc Donald P 1985. Investment Projects in Agriculture- Principles and Case studies. Longman Group Limited. Essex. UK y Pandey
14. U K 1990. An Introduction to Agricultural Finance .Kalyani Publishers New Delhi.

18HO2021 POSTHARVEST MANAGEMENT AND PROCESSING OF HORTICULTURAL CROPS

Credits 2:0:2

Course Objectives

- To learn about the importance of postharvest technology of horticultural crops and related concepts
- To be familiar with post-harvest operations of fruits, vegetables, ornamentals, plantation crops, spices, medicinal and aromatic plants
- To be familiar with government schemes and regulations with regard to import and export of horticultural produce
- To learn about the various food processing methods of horticultural crops

Course Outcomes

- Remember the different post harvest management in important horticultural crops
- Explain the value addition process of important horticultural crops
- Develop knowledge about the government schemes and laws in import and **Theory**

Importance of Postharvest Technology in horticultural crops. Maturity indices, harvesting, handling, grading of fruits, vegetables, cut flowers, plantation crops, spices, medicinal and aromatic plants. Pre-harvest factors affecting quality, factors responsible for deterioration of horticultural produce, physiological and bio-chemical changes, hardening and delaying ripening process. Postharvest treatments of horticultural crops. Quality parameters and specifications. Structure of fruits, vegetables and cut

flowers related to physiological changes after harvest. Pre-harvest treatment and pre-cooling, prestorage treatments. Different systems of storage, packaging methods and types of packages, recent advances in packaging. Principles and methods of preservation by heat - pasteurization, canning, bottling. Methods of preparation of juices, squashes, syrups, cordials and fermented beverages. Jam, jelly and marmalade. Preservation by sugar and chemicals, candies, crystallized fruits, preserves chemical preservatives, preservation with salt and vinegar, pickling, chutneys and sauces, tomato and mushrooms, freezing preservation. Processing of plantation crops, products, spoilage in processed foods, quality control of processed products, Govt. policy on import and export of processed fruits. Food laws.

Practical

Practice in judging the maturity of various horticultural produce, determination of physiological loss in weight and quality. Grading of horticultural produce, post-harvest treatment of horticultural crops, physical and chemical methods. Packaging studies in fruits, vegetables, plantation crops, spices and cut flowers by using different packaging materials, methods of storage, post-harvest disorders in horticultural produce. Equipments used in food processing units. Physico-chemical analysis of fruits and vegetables. Canning of fruits and vegetables, preparation of squash, RTS, cordial, syrup, jam, jelly, marmalade, candies, preserves, chutneys, sauces, pickles (hot and sweet). Dehydration of fruits and vegetables tomato product dehydration, refrigeration and freezing, cut out analysis of processed foods. Processing of plantation crops. Visit to processing units.

References:

1. Verma, L. R. and Joshi, V. K. 2000. *Post Harvest Technology of Fruits and Vegetables*. Vol. I & II. Indus Publishing Co., New Delhi.
2. FAO - Training Manual No.17/2. 2007. *Prevention of post harvest food losses: Fruits, Vegetables and Root crops*. Daya Publishing House, Delhi.
3. Morris, T. N. 2006. *Principles of Fruit Preservation*. Biotech Books, Delhi. 81-7622-116-3.
4. Rathore N.S., G.K. Mathur., Chasta S.S. 2012. *Post-Harvest Management and Processing of Fruits and Vegetables*. The Energy And Resources Institute
5. Srivastava, R. P. & Sanjeev Kumar. 2002. *Fruits and vegetable Preservation – Principles and Practice*. International Book Distributing Co., Lucknow.

18HO2022 BREEDING AND SEED PRODUCTION OF FLOWER AND ORNAMENTAL PLANTS

Credits 2:0:1

Course Objectives

- To study about breeding methods and techniques of important flowers and ornamentals
- To learn about the various seed production and biotechnological techniques for genetic improvement of flowers and ornamentals
- To be familiar with seed certification laws

Course Outcome

At the end of this course, the students will be able to

- Remember the different breeding aspects in important flower and ornamental crops
- Explain the seed production techniques in important flower and ornamental crops
- Gain knowledge about seed certification

Theory

History of improvements of ornamental plants, Centre of origin of flower crops and ornamental crops, objectives and techniques in ornamental plant breeding. Introduction, selection, hybridization, mutation and biotechnological technique for improvement of ornamental and flower crops *viz.*, Rose, Jasmine, Chrysanthemum, Tuberose, Gerbera, Gladiolus, dahlia Heliconia, Liliun, Gaillardia, Petunia, *Hibiscus*, Bouganvillea, Zinnia, Cosmos, Dianthus, Snapdragon, Pansy, crossandra, marigold, geranium, antirrhinum, china aster, orchids, anthurium, carnation, hibiscus etc. Breeding for disease resistance.

Development of promising cultivars of important ornamentals and flower crops. Role of heterosis and its exploitation, production of F1 hybrids and utilization of male sterility, production of open pollinated seed. Harvesting processing and storage of seeds, seed certification.

Practical

Study of floral biology and pollination in important species and cultivars. Techniques of inducing polyploidy and mutation. Production of pure and hybrid seeds. Harvesting, conditioning and testing of seeds. Practice in seed production methods.

References:

1. Bose T.K, L.P. Yadav, P. Patil, P. Das and V.A. Partha Sarthy. 2003. *Commercial flowers*. Partha Sankar Basu.
2. Bhattacharjee S.K and L.C. De. 2003. *Advanced Commercial Floriculture*. Aavishkar Publishers, Distributors, Jaipur, India.
3. Callaway D.J and M.B. Callaway. 2000. *Breeding Ornamental Plants*. Timber Press
4. Singh A.K. 2014. *Breeding and Biotechnology of Flowers : Vol.02 Garden Flowers*. New India Publishing Agency
5. Vainstein A. 2002. *Breeding for Ornamental: Classical and Molecular Approaches*. Springer Publishers

18HO2023 NEMATODE PESTS OF HORTICULTURAL CROPS AND THEIR MANAGEMENT

Credits 1:0:1

Course Objectives

- To study taxonomy, classification, and characteristics of plant parasitic nematodes
- To learn about the role of nematodes in plant disease complex
- To be familiar with principles of integrated nematode management

Course Outcome

At the end of this course, the students will be able to

- Remember taxonomy, classification and characteristics of plant-parasitic nematodes
- Explain role of nematodes in plant disease complex
- Gain knowledge on Integrated nematode management

Theory

History and development of nematology - definition, economic importance. General characters of plant parasitic nematodes, their morphology, taxonomy, classification, biology, symptomatology and control of important plant parasitic nematodes of fruits – (tropical, subtropical and temperate) vegetables, tuber, ornamental, spice and plantation crops. Role of nematodes in plant disease complex. Integrated nematode management.

Practical

Methods of sampling and extraction of nematodes from soil and plant parts, killing, fixing and preparation of temporary and permanent nematode mounts. Nematicides and their use. Collection and preservation of 20 plant species/parts damaged by plant parasitic nematodes.

References:

1. Aurelio Ciancio and K.G. Mukerji. 2009. *Integrated Management of Fruit Crops Nematodes*. Springer Publications.
2. Jonathan E.I, I. Cannayane, K. Devrajan, S. Kumar, S. Ramakrishan, *Agricultural Nematology*. TNAU, Coimbatore.
3. Vasanth Raju David, B. 2001. *Elements of economic entomology*. Popular book Depot, Chennai.

18HO2024 APICULTURE, SERICULTURE AND LAC CULTURE

Credits 1:0:1

Course Objectives

- To learn about different beneficial insects such as honey bee, silkworm and lac insect
- To study in detail about the classification, life cycle and maintenance of honey bee
- To learn about rearing of mulberry silkworm, mulberry cultivation, and economics of silk production and lac growing in India
- To know about the pest and diseases of honey bees, silkworms and lac insects

Course Outcome

At the end of this course, the students will be able to

- Remember various kinds of beneficial insects
- Explain rearing techniques/methods used for mass production of beneficial insects
- Gain knowledge about the pest and disease of honey bees, silkworms and lac insects and other constraints in mass production of beneficial insects

Theory

Introduction to beneficial insects. Importance and History of apiculture. Species of honey bees, Rock bee, Little bee, Indian bee, European bee, Italian bee and Dammar bee, lifecycle and caste determination. Bee colony maintenance, bee colony activities, starting of new colony, location site, transferring colony, replacement of queen, combining colonies, swarm prevention, colony management in different seasons, Equipment for apiary, types of bee hives and their description. Bee pasturage. Honey extraction, honey composition and value, bee wax and tissues. Importance, History and development in India, silkworms kinds and their hosts, systematic position, distribution, lifecycles in brief, Silk glands. Mulberry silkworm-morphological features, races, rearing house and equipments, disinfection and hygiene. Grainage acid treatment, packing and transportation of eggs, Incubation, black boxing, hatching of eggs. Silkworm rearing young age /chawki rearing and old age rearing of silkworms. Feeding, spacing, environmental conditions and sanitation. Cocoon characters colour, shape, hardness and shell ratio. Defective cocoons and stifling of cocoons. Uses of silk and by-products. Economics of silk production. Moriculture- Mulberry varieties, package of practices, Pests and diseases and their management. Lac growing areas in India, Lac insects, biology, behaviour, lac cultivation, food plants, pruning, inoculation, cropping, kinds of lac. Enemies of lac-insects.

Practical

Honey bee colony, different bee hives and apiculture equipment. Summer and Winter management of colony. Honey extraction and bottling. Study of pests and diseases of honeybees. Establishment of mulberry garden. Preparation of mulberry cuttings, planting methods under irrigated and rainfed conditions. Maintenance of mulberry garden-pruning, fertilization, irrigation and leaf harvest. Mulberry pests and diseases and their management and nutritional disorders. Study of different kinds of silkworms and mulberry silkworm morphology, silk glands. Sericulture equipments for silkworm rearing. Mulberry silkworm rearing room requirements. Rearing of silkworms-chalky rearing. Rearing of silkworms late age silkworm rearing and study of mountages. Study of silkworm pests and their management. Study of silkworm diseases and its management. Lac insects-biology, behaviour, lac cultivation, food plants, pruning, inoculation, cropping, kinds of lac. Enemies of lac insects.

References:

1. David B.R and V.V.Ramamurthy. 2007 Elements of Economic Entomology, 7th Edition. Namrutha Publications, Chennai
2. Mishra R.C. and Rajesh Gar. 2002. Prospective in Indian Apiculture. Agrobios, Jodhpur.
3. Narasaiah M.L. Problems and Prospects of Sericulture. discovery publishing House Pvt. Ltd.
4. Singh, D and Singh, D.P. 2006. A hand book of Beekeeping, Agrobios (India).
5. Sunita, N.D, Guled ,M.B, Mulla S.R and Jagginavar,2003, Beekeeping, UAS Dharwad
6. Srivastava K.P .A Text Book on Applied Entomology Vol. I&II. , Kalyani Publishers, Ludhiyana

18HO2025 STUDY TOUR – II

Credits 0:0:1

Course Objectives

- To be familiar with the various horticultural research stations in the state of Tamilnadu/India
- To learn about the ongoing agricultural research and extension programmes organized by various horticultural research stations in the state/Country

Course Outcome

At the end of this course, the students will be able to

- Gain practical knowledge about horticultural crops and cropping systems in the different agro-climatic zones and horticultural crops in Tamil Nadu
- Learn social, cultural aspects of different agricultural zones in TamilNadu
- Identify and analyze different soil types and cropping systems for horticultural crops in Tamil Nadu

Course Content:

The study tour programme is of one week, during this period various Agricultural Research Stations, Institutions or Colleges will be visited. This is to get an exposure of various ongoing research and extension activities in different agro- eco systems in the State/Country.

Evaluation and mark distribution

In the study tour programme, full attendance is mandatory for a pass as per the ICAR regulations.

The marks awarded as follows for the evaluation of the courses

Attendance and general behaviour	- 35
Report of the study tour	- 35
Exam (internal)	- 20
Viva	- 10
Total	- 100

HORTICULTURE

LIST OF COURSES

S.No.	Course Code	Name of the Course	Credits
1	18HO1001	Fundamentals of Horticulture	2:0:1
2	18HO1002	Growth and Development of Horticultural Crops	2:0:1
3	18HO1003	Propagation and Nursery Management for Horticultural Crops	2:0:1
4	18HO1004	Production Technology of Tropical and Subtropical Fruits	2:0:1
5	18HO1005	Production Technology of Tropical and Subtropical Vegetables	2:0:1
6	18HO1006	Irrigation and Weed Management in Horticultural Crops	2:0:1
7	18HO2001	Commercial Floriculture	2:0:1
8	18HO2002	Production Technology of Spices and Plantation Crops	2:0:1
9	18HO2003	Precision Farming and Protected Cultivation	2:0:1
10	18HO2004	Diseases of Fruit, Plantation, Medicinal and Aromatic Crops	2:0:1
11	18HO2005	Soil Fertility and Nutrient Management	1:0:1
12	18HO2006	Production Technology of Temperate Vegetable Crops	1:0:1
13	18HO2007	Production Technology of Temperate Fruit Crops	1:0:1
14	18HO2008	Production Technology of Medicinal and Aromatic Crops	2:0:1
15	18HO2009	Breeding of Vegetables, Medicinal and Aromatic Crops	3:0:1
16	18HO2010	Diseases of Vegetables, Flowers, Ornamentals and Spice Crops	2:0:1
17	18HO2011	Insect Pests of Fruit, Plantation, Medicinal & Aromatic Crops	2:0:1

18HO1001 FUNDAMENTALS OF HORTICULTURE

Credits 2:0:1

Course Objectives

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

Course Outcome

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

Theory

Scope and importance, nutritive value - Classification of horticultural crops, Area, production, exports and imports, Agro-climatic zones of India - Nursery techniques and their management, Vegetable gardens, nutrition, kitchen garden and other types of gardens, Phases of growth and development - Factors affecting growth and development –Propagation of horticultural crops –Cutting and Layering - Grafting and Budding - Rootstock - scion relationships, Compatibility and incompatibility - Asexual propagation – Apomixis and Polyembryony - Orchard establishment - Principles, planning and layout of orchards - Planting systems and planting densities –Management of orchards – Intercultural operations, Principles objectives and types of pruning - training - Fruit set - carbon nitrogen relation, structure and process in relation to set and drop, factors affecting and measures to overcome drop - Bearing habit and Classification of bearing habits of fruit trees - Problems of unfruitfulness - internal factors, external factors – measures to overcome - Seedlessness in horticultural crops - significance and induction - Plant growth regulators - Water management– irrigation methods, merits and demerits - Weed management – Fertility management in horticultural crops-manures and fertilizers - Cropping systems, intercropping, multi-tier cropping - Rejuvenation of old orchards, top working and frame working - Production and practices for fruit, vegetable and floriculture crops - Principles of organic farming - Supply chain management.

Practical

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

Text books

1. Jitendra Singh, 2004. Basic of horticulture. Kalyani publishers, Ludhiana.
2. Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil, TamilNadu.

18HO1002 GROWTH AND DEVELOPMENT OF HORTICULTURAL CROPS

Credits 2:0:1

Course objectives

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

Course outcomes

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

Theory

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

Practical

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

Text books

1. Zeiger. 2003.Plant Physiology. Panima. New Delhi.
2. Delvin, R.M . 1986. Plant Physiology. CBS. Delhi.
3. Edward E. Durna. 2014. Principles of Horticultural Physiology. CABI, UK.

18HO1003 PROPAGATION AND NURSERY MANAGEMENT FOR HORTICULTURAL CROPS

Credits 2:0:1

Course Objectives

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

Course Outcome

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

Theory

Propagation: Need and potentialities for plant multiplication, sexual and asexual methods of propagation, advantages and disadvantages. Seed dormancy types of dormancy (scarification & stratification) internal and external factors, nursery techniques nursery management, apomixes – monoembryony, Polyembryony, chimera & bud sport. Propagation Structures: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, phytotrons nursery (tools and implements), use of growth regulators in seed, types and stages of seed germination with examples and vegetative propagation, methods and techniques of division-stolons, pseudo-bulbs, offsets, runners, cutting, layering, grafting, formation of graft union, factor affecting, healing of graftage and budding physiological & bio chemical basis of rooting, factors influencing rooting of cuttings and layering, graft incompatibility. Anatomical studies of bud union, selection and maintenance of mother trees, collection of scion wood stick, scion-stock relationship, and their influences, bud wood certification, techniques of propagation through specialized organs, corm, runners, suckers. Micro-propagation – Micro-grafting, meristem culture, callus culture, anther culture, organogenesis, Somaclonal variation hardening of plants in nurseries. Nursery registration act. Insect/pest/disease control in nursery.

Practical

Media for propagation of plants in nursery beds, potting and repotting. Preparation of nursery beds and sowing of seeds. Raising of rootstock. Seed treatments for breaking dormancy and inducing vigorous seedling growth. Preparation of plant material for potting. Hardening plants in the nursery. Practicing different types of cuttings, layering, grafting and budding including opacity and grafting, top grafting and bridge grafting etc. Use of mist chamber in propagation and hardening of plants. Preparation of plant growth regulators for seed germination and vegetative propagation. Visit to a tissue culture laboratory. Digging, labelling and packing of nursery fruit plants. Maintenance of nursery records. Use of different types of nursery tools and implements for general nursery and virus tested plant material in the nursery. Cost of establishment of a mist chamber, greenhouse, glasshouse, polyhouse and their maintenance. Nutrient and plant protection applications during nursery. Cost of establishment of propagation structures.

Text books

1. Hartmann, H.T., D.E. Kester, F.T. Davies and R.L. Greeneve. 2006 Plant Propagation. Principles and Practices. Prentice Hall of India Private Ltd., New Delhi.
2. Prasad, S. and U. Kumar, 2005. Principle of Horticulture. 3rd edition, Agrobios, India.

18HO1004 PRODUCTION TECHNOLOGY OF TROPICAL AND SUBTROPICAL FRUITS

Credits 2:0:1

Course Objective:

- To impart knowledge on basic cultural practices of Tropical and Subtropical Fruitscrops
- To insist on modern techniques to increase the yield and production
- To learn about the special practices, harvesting and post-harvest handling of Tropical and Subtropical Fruits

Course Outcome:

- The student gains a thorough knowledge on basic production technology
- Familiarize on modern production techniques
- Acquaintance on special practices, harvesting and post-harvest handling

Theory

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

Practical

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

Text books

1. Alice Kurian and K.V. Peter. 2007. Commercial Crops Technology, Horticultural Sciences Series Vol-8. ed. by K.V. Peter, New India Publishing Agency, New Delhi.
2. H.P.Singh and M.M.Mustafa, 2009. Banana-new innovations. Westville PublishingHouse, New Delhi.
3. M.S.Ladaniya, 2013. Citrus Fruits. Elsevier, India post ltd.
4. Bose, T.K., Mitra, S.K. and Sanyal, D., 2002. Tropical and Sub-Tropical-Vol-I. Nayayudyog-Kolkata
5. Rajput, CBS and Srihari babu, R., 1985. Citriculture. Kalyani Publishers, New Delhi.
6. Chundawat, B.S., 1990. Arid fruit culture. Oxford and IBH, New Delhi.
7. Chadha,K.L. (ICAR) 2002, 2001. Hand book of Horticulture. ICAR, New Delhi.
8. Symmonds, 1996. Banana. II Edn. Longman, London.
9. Radha T and Mathew L., 2007. Fruit crops. New India Publishing Agency.
10. W S Dhillon, 2013. Fruit Production in India. Narendra Publishing House, New Delhi
11. T.K.Chattopadhyay, 1997. Text book on pomology. Kalyani Publishers, New Delhi.

18HO1005 PRODUCTION TECHNOLOGY OF TROPICAL AND SUBTROPICAL VEGETABLES**Credits 2:0:1****Course Objective:**

- To impart knowledge on basic cultural practices of vegetables crops.
- To insist on modern techniques to increase the yield and production.

- To learn about the economic estimation of commercial vegetable crops.

Course Outcome:

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

Theory

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

Practical

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

Text book

1. S. Thamburaj, 2014. Text book of vegetable, tuber crops and Spices. ICAR, New Delhi
2. B.R.Choudhary, 2009. A Text book on production technology of vegetables. Kalyani Publishers. Ludhiana.
3. Alice Kurian and K.V. Peter. 2007. Commercial Crops Technology, Horticultural Sciences Series Vol-8. ed. by K.V. Peter, New India Publishing Agency, New Delhi.
4. T.K.Bose, 2002. Vegetable Crops. Nayaprakash. Kolkata
5. P.Hazra, 2011. Modern Technology in Vegetable Production. New India Publishing Agency. New Delhi.
6. T.R.Gopal Krishnan, 2007. Vegetable Crops. New India Publishing Agency. New Delhi.
7. K.V.Kamath, 2007. Vegetable Crop Production. Oxford Book Company. Jaipur
8. M.S.Dhaliwal, 2008. Handbook of Vegetable Crops. Kalyani Publishers. Ludhiana

18HO1006 IRRIGATION AND WEED MANAGEMENT IN HORTICULTURAL CROPS

Credits 2:0:1

Course objectives

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

Course objectives

- Students gained practical knowledge on surface irrigation, pressurized irrigation, micro irrigation and fertigation
- Students learnt the layout of micro irrigation (Drip irrigation) to the horticultural crops

- Students gained knowledge on the principles of integrated weed management with special reference to horticultural plants

Theory

Importance of water, water resources in India. Area of different crops under irrigation, function of water for plant growth, effect of moisture stress on crop growth. Available and unavailable soil moisture – distribution of soil moisture – water budgeting – rooting characteristics – moisture extraction pattern. Water requirement of horticultural crops – lysimeter studies – Plant water potential climatological approach – use of pan evaporimeter – factor for crop growth stages – critical stages of crop growth for irrigation. Irrigation scheduling – different approaches – methods of irrigation – surface and sub-surface pressurized methods viz., sprinkler and drip irrigation, their suitability, merits and limitations, fertigation, economic use of irrigation water. Water management problem, soils quality of irrigation water, irrigation management practices for different soils and crops. Layout of different irrigation systems, drip, sprinkler. Layout of underground pipeline system.

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination; Weed biology and ecology, crop weed association, crop weed competition and allelopathy Concepts of weed prevention, control and eradication; Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management; Herbicides: advantages and limitation of herbicide usage in India, Herbicide classification, formulations, methods of application; Introduction to Adjuvants and their use in herbicides; Introduction to selectivity of herbicides; Compatibility of herbicides with other agro chemicals; Weed management in major field and horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

Practical

Measurements of irrigation water by using water measuring devices, use of common formula in irrigation practices, practicing of land leveling and land shaping implements, layout for different methods of irrigation. Estimation of soil moisture constants and soil moisture by using different, methods and instruments, scheduling of irrigation, different approaches, practicing use of instruments, estimation of irrigation efficiency and water requirements of horticultural crops, irrigation planning and scheduling, soil moisture conservation practices. Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of herbarium of weeds; Calculations on weed control efficiency and weed index; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops; Biology of nut sedge, bermuda grass, parthenium and celosia; Economics of weed control practices; Tours and visits of problem areas.

Text books

1. Rao, Y.P. and Bhaskar, S.R. 2008. Irrigation Technology. Theory and practice. Agrotech publishing Academy, Udaipur.
2. Dilip Kumar Mujmdar. 2004. Irrigation Water Management: Principles and Practices. Prentice Hall of India Pvt. Ltd.,
3. S.V. Patil&Rajakumar, G. R., 2016. Water Management in Agriculture and Horticultural Crops. Satish serial publishing House, Delhi.

18HO2001 COMMERCIAL FLORICULTURE

Credits 2:0:1

Course objectives

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

Course outcomes

- Understand the production technology of commercial flowers
- Understanding the harvesting and post-harvest handling of loose and cut flowers
- Equipped for entrepreneurship in commercial floriculture

Theory

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

Practical

Identification of commercially important floricultural crops. Propagation practices in chrysanthemum, sowing of seeds and raising of seedlings of annuals. Propagation by cutting, layering, budding and grafting. Training and pruning of roses. Use of chemicals and other compounds for prolonging the vase life of cut flowers. Drying and preservation of flowers. Flower arrangement practices.

Reference books

1. Bose, T.K., Yadav, L.P., Pal. P., Parthasarathy, V.A., Das. P., 2003. Commercial flowers. Vol.I and II.Nayaudyog, Kolkata-6.
2. Prasad, S. and U. Kumar, 1998. Commercial floriculture. Agro Botanica. Bikaner - 334 003.
3. Vishnu Swarup. 1997. Ornamental Horticulture. Macmillan India Ltd., NewDelhi-2.
4. Foja Singh, 1997. Advances in Floriculture. Media Today Pvt Ltd., New Delhi-17
5. Roy.A.Larson.1992. Introduction of Floriculture. International Book Distributing Co., Lucknow.
6. Bose,T. K. and P. Yadav. 1989. Commercial flowers. NayaPrakash, Calcutta
7. Bose, T.K., Yadav, L.P., Pal. P., Parthasarathy, V.A., Das. P., 2003. Commercialflowers. Vol.I and II.Nayaudyog, Kolkata-6.
8. Bhattacharjee and De. L.C. 2004 – Advanced Commercial Floriculture. Vol. I & II.
9. Bhattacharjee, S.K., 2004 – Advanced commercial floriculture. Vol. I and II.

18HO2002 PRODUCTION TECHNOLOGY OF SPICES AND PLANTATION CROPS

Credits 2:0:1

Course Objectives

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

Course Outcome

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

Theory

Spices: History, scope and importance, Present status, area and production, uses, export potential and role in national economy. Classification, soil and climate, propagation-seed, vegetative and micro-propagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products, methods of extraction of essential oil and oleoresins. Economics of cultivation, role of Spice Board and Pepper. Export Promotion Council, institutions and research centers in R&D. Crops: Cardamom, pepper, betel

vine ginger, turmeric, clove, nutmeg, cinnamon, all spice, curry leaf, coriander, fenugreek, fennel, cumin, dill, celery, bishops weed, saffron, vanilla, thyme and rosemary.

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

Practical

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

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

Text books

1. Kumar, N, Md. Abdul Khader, P. Rangasamy, and I. Irulappan, 1994. Spices, Plantation Crops, Medicinal and Aromatic plants, Rajalakshmi Publications, Nagercoil
2. Alice Kurian and K.V. Peter. 2007. Commercial Crops Technology, Horticultural Sciences Series Vol-8. ed. by K.V. Peter, New India Publishing Agency, New Delhi.
3. Shanmugavelu, K.G., N. Kumar and K.V. Peter 2005. Production Technology of Spices and Plantation Crops. Agrobios (India), Jodhpur.
4. Nybe, E.V., N. Miniraj and K.V. Peter. 2007. Spices – Horticulture Science Series Vol. 5. New India Publishing Agency, New Delhi.

18HO2003 PRECISION FARMING AND PROTECTED CULTIVATION

Credits 2:0:1

Course objectives

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

Course outcomes

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

Theory

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

construction for traditional and low cost green houses. Irrigation systems used in greenhouses, Typical applications, passive solar green house, hot air greenhouse heating systems, green house drying. Cost estimation and economic analysis. Choice of crops for cultivation under greenhouses, problems / constraints of greenhouse cultivation and future strategies. Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics.

Practical

Study of different types of greenhouses based on shape, construction and cladding materials; Calculation of air rate exchange in an active summer winter cooling system; Calculation of rate of air exchange in an active winter cooling system; Estimation of drying rate of agricultural products inside green house; Testing of soil and water to study its suitability for growing crops in greenhouses; The study of fertigation requirements for greenhouses crops and estimation of E.C. in the fertigation solution; The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization; Visit to commercial greenhouses; Economics of protected cultivation.

Reference books

1. Handbook of agricultural engineering, 2016. ICAR, New Delhi.
2. Adams, C.R. K.M. Bandford and M.P. Early. 1996. Principles of Horticulture. CBS publishers and distributors. Darya ganj, New Delhi.

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

Credits 2:0:1

Course objectives

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

Course outcomes

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

Theory

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

Practical

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

Reference books

1. Arjunan.G. Karthikeyan, G, Dinakaran ,D. Raguchander,T. 1999 Diseases of Horticultural Crops, AE Publications, Coimbatore
2. Rangaswamy C.2005, Diseases of crop plants in India –. Prentice Hall of India, Pvt. Limited, New Delhi

18HO2005 SOIL FERTILITY AND NUTRIENT MANAGEMENT

Credits 1:0:1

Course Objectives:

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

Course Outcome:

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

Theory

Introduction to soil fertility and productivity- factors affecting. Essential plant nutrient elements- functions, deficiency systems, transformations and availability. Acid, calcareous and salt affected soils – characteristics and management. Soil organic matter, Role of microorganisms in organic matter- decomposition – humus formation. Importance of C:N ratio and pH in plant nutrition, soil buffering capacity. Integrated plant nutrient management. Soil fertility evaluation methods, critical limits of plant nutrient elements and hunger signs. NPK fertilizers: composition and application methodology, luxury consumption, nutrient interactions, deficiency symptoms, visual diagnosis. Plant nutrient toxicity symptoms and remedies measures. Soil test crop response and targeted yield concept. Biofertilizer. Nutrient use efficiency and management. Secondary and micronutrient fertilizer. Fertilizer control order. Manures and fertilizers classification and manufacturing process. Properties and fate of major and micronutrient in soils. Fertilizer use efficiency and management. Effect of potential toxic elements in soil productivity.

Practical

Analysis of soil for organic matter, available N, P and K and Micronutrients and interpretations. Gypsum requirement of saline and alkali soils. Lime requirement of acid soils. Estimation of organic carbon content in soil. Determination of Boron and chlorine content in soil. Determination of Calcium, Magnesium and Sulphur in soil. Sampling of organic manure and fertilizer for chemical analysis. Physical properties of organic manure and fertilizers. Total nitrogen in urea and farmyard manure. Estimation of ammonical nitrogen and nitrate nitrogen in ammonical fertilizer. Estimation of water soluble P₂O₅, Ca and S in SSP, Lime and Gypsum. Estimation of Potassium in MOP/SOP and Zinc in zinc sulphate. Visiting of fertilizer testing laboratory.

Text books

1. Mengel, et al., 2001. Principles of Plant Nutrition (5th Edition), Springer.
2. Das, D .K., 2011. Introductory Soil Science (3rd Edition), Kalyani Publisher, Ludhiana (India).
3. Yawalkar K S, Agarwal JP and Bokde S, 1992. Manures and Fertilizers. Agri. Horticultural Publishing House, Nagpur.
4. Havlin et al. 2014. Soil Fertility and Fertilizers: An Introduction to Nutrient Management (8th Edition), PHI Learning Pvt. Ltd., Delhi.

18HO2006 PRODUCTION TECHNOLOGY OF TEMPERATE VEGETABLE CROPS

Credits 1:0:1

Course objectives

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

Course outcomes

- Scope and importance of temperate vegetable crops learned
- Advance production technology of temperate vegetable crops studied

- Gain practical knowledge on post-harvest handling of temperate vegetable crops

Theory

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

Practical

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

Text books

1. Prem Singh Arya and S. Prakash 2002. "Vegetable growing in India", Kalyani publishers, New Delhi
2. Alice Kurian and K.V. Peter. 2007. Commercial Crops Technology, Horticultural Sciences Series Vol-8. ed. by K.V. Peter, New India Publishing Agency, New Delhi.
3. Bose, T. K, Kabir, J., Maity T. K., Parthasarathy V. A., and Som M. G., 2002. Vegetable Crops Vol. II & III NayaProkash, Kolkata.

18HO2007 PRODUCTION TECHNOLOGY OF TEMPERATE FRUIT CROPS

Credits1:0:1

Course Objectives

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

Course Outcome

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

Theory

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

Practical

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

Text books

1. Bose, T. K. S. K. Mitra, and D. S. Rathore. 1998. Temperate Fruits - Nayaprakash, Calcutta
2. Chattopadhyay, T.K., 2001. A Text Book on Pomology (4 volumes),Kalyani Publishers, Ludhiana.
3. Alice Kurian and K.V. Peter. 2007. Commercial Crops Technology, Horticultural Sciences Series Vol-8. ed. by K.V. Peter, New India Publishing Agency, New Delhi.

18HO2008 PRODUCTION TECHNOLOGY OF MEDICINAL AND AROMATIC CROPS

Credits 2:0:1

Course Objectives

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

Course Outcome

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

Theory

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

Practical

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

Text books

1. Alice Kurian, M. Asha Sankar (Authors) & K.V. Peter (Ed.), 2007. Medicinal Plants, (Horticulture Science Series-2)Published by New India Publishing Agency, New Delhi.
2. Kumar, N, Md. Abdul Khader, P. Rangasamy, and I. Irulappan, 1994. Spices, Plantation Crops, Medicinal and Aromatic plants, Rajalakshmi Publications, Nagercoil.
3. Chadha, K. L. (ed.) 2001. Handbook of Horticulture. ICAR Publication, New Delhi.

18HO2009 BREEDING OF VEGETABLES, MEDICINAL AND AROMATIC CROPS

Credits 3:0:1

Course objective

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

Course outcome

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

Theory

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops. Plant genetic resources, their conservation and utilization in crop improvement. Breeding for insect resistance, breeding for disease resistance, breeding for abiotic resistance, male sterility and incompatibility and their utilization in development of hybrids. Origin, distribution of species, wild relatives and forms of vegetable crops Tomato, Brinjal, Bhendi, Capsicum, Chilli, Cucurbits, Cabbage, Cauliflower, Tuber crops, Potato, Carrot, Radish. Breeding procedures for development of hybrids/varieties in various crops. Genetic basis of adoptability and stability. Floral biology, methods of breeding and achievements in crop improvement medicinal crops :senna, gloriosa and coleus and aromatic crops: mint and cymbopogon.

Practical

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

Text Books

1. Prem Singh Arya, 2003. Vegetable breeding, production and seed production, Kalyani publishers, New Delhi.
2. Harihar Ram. 1998. Vegetable Breeding – Principles and Practices. Kalyanipublishers, New Delhi.
3. Akhilesh Sharma, VivekaKatoch, Susheel Sharma and Chanchal Rana, 2016. Practical on Vegetable breeding. Kalyani Publishers, New Delhi.

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

Credits 2:0:1

Course Objectives:

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

Course Outcome:

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

Theory

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

Practical

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

Reference books

1. Srikant Kulkarni, Yashoda R. Hedge. Diseases of Plantation crops and their management-, Agrotech publication Academy
2. S.L. Godara, BBS Kapoor, B.S. Rathore. Disease management of spice crops-, Madhu Publications.
3. L.DarwinChristdhar Henry and H.LewinDevasahayam Crop diseases: Identification, Treatment and Management. An Illustrated Handbook –, New India publishing Agency
4. Singh, R.S. 1994. Diseases of Vegetable Crops. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi
y Singh, R.S 1996. Plant Diseases. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi
5. Sohi, H.S. 1992. Diseases of Ornamental plants in India. ICAR, New Delhi
6. RangaSwamy, G. 1988. Diseases of Crop Plants in India.Prentice Hall of India Pvt. Ltd., New Delhi.
7. Saha, L.R. 2002. Hand Book of Plant Diseases. Kalyani Publishers
8. Arjunan, G. Karthikeyan, G. Dinakaran, D. Raguchander, T. 1999. Diseases of Horticultural Crops. .Dept. of Plant Pathology,Tamilnadu Agricultural University Coimbatore.

18HO2011 INSECT PESTS OF FRUIT, PLANTATION, MEDICINAL & AROMATIC CROPS

Credits 2:0:1

Course objective

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

Course outcome

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

Theory

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

Practical

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

Text Books

1. David, B.V. 2006. Elements of Economic Entomology. Popular Book Depot, Chennai.
2. Butani, D.K. 2009. Insects and Fruits. Periodical Expert Book Agency, New Delhi.

HORTICULTURE

LIST OF COURSES

Sl. No.	Course Code	Name of the Course	Credits
1	17HO1001	Botany of Horticultural Crops	3:0:0
2	17HO1002	Propagation of Horticultural Crops	2:0:1
3	17HO1003	Production Technology of Tropical Fruit Crops	2:0:1
4	17HO1004	Production Technology of Tropical Vegetable Crops	2:0:1

17HO1001 BOTANY OF HORTICULTURAL CROPS

Credits: 3:0:0

Course Objectives:

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

Course Outcome:

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

Description:

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

Practical:

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

References:

1. Mauseth, J.D. 2009. Botany: An Introduction to Plant Biology. Jones and Bartlett Publishers, MA.
2. Spichiger, R., Savolainen, V., Figeat, M., Jeanmond, D. 2004. Systematic Botany of Flowering Plants. Science Publishers Inc., USA.
3. Jansi Rani, P. Subramanian, S., Veeraragavathatham and S. Thamburaj, 1997. Botany of Vegetable Crops. KRS Screen Printers, Lawley Road, Coimbatore.
4. Gangulee, Das and Datta. 1997. College Botany Vol. I. New Central Book Agency (P) Ltd., Calcutta
5. Genin, A. 1994. Application of Botany in Horticulture. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Kochhar, S.L. 1992. Economic Botany in the Tropics. Macmillan India Ltd., Madras
7. Madhu Arora, 1991, Dictionary of Botany. Anmol Publications Pvt. Ltd., New Delhi.
8. Joseph Y. Bergen, 1990. Fundamentals of Botany. Arihant Publishers, Jaipur

9. Subhash Chandra Datt, 1989. Systematic Botany – Willey Eastern Ltd., New Delhi.
10. Bahadur and Achari. 1989. A Manual of Botany. Anmol Publications, New Delhi.
11. Sambamurthy and Subrahmanyam. 1989. Text Book of Economic Botany. Wiley Eastern Ltd., New Delhi.
12. Simpson, B.B. and Ogorzaly, M.C. 1986. Economic Botany. McGraw Hill Book Company, New York.

17HO1002 PROPAGATION OF HORTICULTURAL CROPS

Credits: 2:0:1

Course Objectives:

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

Course Outcome:

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

Description:

Basics of plant propagation: Scope and importance - different methods - definitions – sexual propagation - importance, advantages and disadvantages - asexual propagation - importance, advantages and disadvantages - agencies involved in the nursery development - government schemes for development of nurseries - establishment of nursery - site selection - tools and implements - mist chamber - phytotron – humidifiers - greenhouse - glasshouse - polyhouse - shade net - cold frames - hot beds - pit nursery -ball and bur lapped culture - media and containers - soil sterilization - manures and manuring - liquid manures. Sexual propagation: Micro and megasporogenesis - apomixis - mono and polyembryony - seeds - quality - nursery bed - protray culture - sowing - seed viability - longevity - germination - dormancy - types of dormancy - seed treatments - seed invigoration - seedling vigour. Asexual propagation: cutting and layering. Genetic variations - chimeras and types - methods of vegetative propagation identification of plus trees – mother block – raising clonal nursery - types of cuttings – factors influencing rooting of cuttings - use of growth regulators - layering – advantages and disadvantages - methods of layering - anatomical and physiological basis of rooting. Asexual propagation: grafting, budding and propagation through special organs. Grafting and budding; Methods - advantages and disadvantages - rootstocks - scion bank - factors for successful graft union - selection, pre-curing and collection of scion - bud wood selection - bud wood certification - anatomical and physiological basis of graft / bud union - stock-scion relationship - root stock influences - after care and hardening – techniques of propagation through specialized organs - tubers - bulbs - corms - runners - suckers - crown - slips - rhizome - offshoots - top working – quality management and nursery certification –display, packing, transport and marketing. Techniques of micro propagation: Micro propagation – definitions - different methods - protocol of micro propagation - Stage I establishment and sterilization - Stage II shoot multiplication - Stage III root formation - Stage IV acclimatization and hardening – specific protocol for aseptic culture - explants - sterilization techniques - types of media - composition - media preparations - meristem tip culture - micro grafting - in vitro clonal propagation of important horticultural crops - constraints and problems in micro propagation – after care - packing, transport and marketing - infrastructure requirements - establishment of commercial tissue culture units - visit to commercial TC units- status of micro propagation in India.

Practical:

Propagation structures - tools and implements - propagation media - containers - preparation of nursery beds - seed treatment - sowing - plug transplants / seedling production - potting, depotting and repotting of plants - methods of asexual propagation through cuttings, layering, grafting and budding - scion bank – techniques of cuttings - leaf and leaf bud cuttings - stem cuttings - single nodal cuttings and root cuttings - techniques of layering - potting of layers and hardening - grafting methods - separation of grafts - potting and maintenance of grafted plants - budding and maintenance of budded plants - mist chamber - structures - maintenance - use of mist chamber for seed and vegetative propagation - hardening and maintenance – shade structure - nutrition and plant protection - application of growth regulators - standardization of formulations - growth regulators for seed and vegetative propagation - project preparation for commercial nurseries – visit to commercial nurseries and tissue culture units.

References:

1. Adams, C.R., K.M. Bandford and M.P. Early. 1996. Principles of Horticulture. CBS Publishers and Distributors, New Delhi. 110 002.

2. Bose, T.K., S.K. Mitra, M. K. Sadhu and B. Mitra. 1991. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prakash, Calcutta
3. Edmond, J.B., T.L. Senna, F.S. Andrews and R.G. Halfacre. 1990. Fundamentals of Horticulture, Tata McGraw Hill Publishing Co. Ltd.
4. Hartmann, H.T., D.E. Kester, F.T. Davies and R.L. Greeneve. 1997. Plant Propagation - Principles and Practices. Prentice Hall of India Private Ltd., New Delhi.
5. Nanda, K.K and V.K. Kochhar. 1995. Vegetative Propagation of Plants. Kalyani Publishers, Ludhiana.
6. Rao, M. K. 1991. Text Book of Horticulture. Macmillan India Ltd., New Delhi 110 002.
7. Rao, M.M. 1990. Recent Developments in Multiplication of Planting Materials by Greenhouse and Tissue Culture Technologies, Short Course Manual of UAS, Dharward.
8. Sadhu, M.K. 1989. Plant Propagation. Wiley Eastern Ltd., 4835/24, New Delhi 110 002.
9. Singh, S.P. 1983. Mist Propagation. Metropolitan Publishing Company, New Delhi
10. Kumar, U. 2002. Methods in Plant Tissue Culture, Second Edition, Agro Bios, Jodhpur.
11. Parthasarathy, V. A. 2001. Biotechnology of Horticultural Crops Vol. I, II & III, Nayoprakash, Calcutta.
12. Ramsawat, K. G. and J.M. Merillan 1999. Biotechnology – Secondary Metabolites Oxford & IBH Publishers, Co (P) Ltd., New Delhi.
13. Purohit, S. S. 1998. Biotechnology: Fundamentals and Applications II Edition; Agro Botanica Bikaner
14. Singh, B.D. 1999. Biotechnology, Kessinger Publishing, New York.
15. Razdon, M.K. 1993. An Introduction to Plant Tissue Culture, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

17HO1003 PRODUCTION TECHNOLOGY OF TROPICAL AND ARID ZONE FRUIT CROPS

Credits: 2:0:1

Course Objectives:

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

Course Outcome:

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

Description:

Principles and cultivation of tropical fruits: Mango and banana-Scope and importance of tropical fruits cultivation – overview: global, national and regional levels – area, production and export potential– horticultural zones of India and Tamil Nadu with emphasis on tropical fruits- GAP- organic production - composition and uses – origin and distribution – species and cultivars - climate and soil requirements - species and varieties - cropping systems- propagation techniques - planting systems and planting density - after care – training and pruning – water management, macro and micronutrient management, weed management – special horticultural techniques - use of plant growth regulators - production constraints - physiological disorders – post harvest handling - economics of production. Tropical fruits- Papaya, sapota and guava: Composition and uses – origin and distribution – species and cultivars – climate and soil requirements, cropping systems- varieties - propagation techniques – planting systems and planting density - after care – training and pruning - water management, macro and micronutrient management, weed management – GAP - organic production - special horticultural techniques – sex forms and pollination - use of plant growth regulators - production constraints - physiological disorders - pre and post-harvest handling - economics of production. Tropical fruits: acid lime, sweet orange and jack fruit: Composition and uses – origin and distribution – species and cultivars – climate and soil requirements, cropping systems- varieties - production constraints - propagation techniques - planting systems and planting density - after care – training and pruning - water management, macro and micronutrient management, weed management - GAP - organic production - special horticultural techniques - use of plant growth regulators - physiological disorders - pre and post-harvest handling – economics of production. Arid zone fruits: Aonla, ber, pomegranate and date palm: Dryland horticulture – importance and scope in India and Tamil Nadu- distribution of arid and semi-arid zones in India and Tamil Nadu; Composition and uses – origin and distribution – species and cultivars - climate and soil requirements – varieties - cropping systems and intercropping – crops suitable for dry land system – spacing and planting patterns for rainfed

horticultural crops- in situ grafting and budding techniques – alternative land use systems – mulching - soil and moisture conservation methods – chemical application – anti-transpirants – management of nutrients, water, weeds and problem soils – training and pruning methods – physiology of flowering – regulation of cropping – top working and rejuvenation – use of plant growth regulators – post harvest handling – economics of production. Arid zone fruits - custard apple, jamun, bael, wood apple and manila tamarind: Composition and uses – origin and distribution – species and cultivars – climate and soil requirements – varieties - cropping systems and intercropping – crops suitable for dry land system – spacing and planting patterns for rain fed horticultural crops- in situ grafting and budding techniques – alternative land use systems – mulching – soil and moisture conservation methods – chemical application – anti-transpirants – management of nutrients, water, weeds and problem soils – training and pruning methods – physiology of flowering – crop regulation – top working and rejuvenation – use of plant growth regulators – post harvest handling – economics of production.

Practical:

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

References:

1. Bose, T. K., S. K. Mitra and D.Sanyal, 2001. Fruits: Tropical and Subtropical. Volume I. Naya Udyog, Calcutta.
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3. Shanmugavelu, K. G. 1987. Production Technology of Fruit Crops. SBA Publications, Calcutta.
4. Singh, S. P. 1995. Commercial Fruits, Kalyan Publishers, Ludhiana.
5. Veeraraghavathatham, D., M. Jawaharlal, S. Jeeva and S. Rabindran, 1996. Scientific Fruit Culture, Suri Associates, Coimbatore.
6. Bose T.K., S. K. Mitra and M. K. Sadhu. 2003, Mineral Nutrition of Fruit Crops. Naya Prakash, Calcutta.
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17HO1004 PRODUCTION TECHNOLOGY OF TROPICAL VEGETABLE CROPS

Credits: 2:0:1

Course Objectives:

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

Course Outcome:

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

Description:

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

yield crops. Tomato, brinjal, chilli and bhendi. Bulbous and Cucurbitaceous vegetable crops: Composition and uses- area and production- climate and soil requirements – season - varieties and hybrids -seed rate – nursery practices – containerized transplant production and transplanting- preparation of field - spacing - planting systems - planting- water and weed management – nutrient requirement – fertigation - nutrient deficiencies – physiological disorders – sex expression - use of chemicals and growth regulators - cropping systems – constraints in production - harvest – yield. Onion, ash gourd, pumpkin, bitter gourd, snake gourd, ribbed gourd, bottle gourd, watermelon, musk melon, coccinia, cucumber and gherkin. Fabaceous vegetable crops and greens: Composition and uses- origin and distribution- area and production- climate and soil requirements – season - varieties and hybrids - seed rate – preparation of field - spacing - planting systems - planting – water and weed management – nutrient requirement – fertigation - nutrient deficiencies – physiological disorders- use of chemicals and growth regulators - cropping systems – constraints in production harvest – yield. Cluster beans, cowpea, lab-lab, moringa, chekurmanis, palak, basella and amaranth. Tuber crops: Composition and uses- origin and distribution- area and production- climate and soil requirements – season - varieties and hybrids - seed rate –preparation of field - nursery practices and transplanting – spacing - planting systems - planting – water and weed management – nutrient requirement – fertigation - nutrient deficiencies – physiological disorders- use of chemicals and growth regulators - cropping systems – - constraints in production –virus elimination in cassava- harvest – yield. Cassava, sweet potato, colocasia, vegetable coleus, amorphophallus, edible dioscorea, and yam bean.

Practical:

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

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2. Uma Shankar Singh, 2008. Indian Vegetables, Anmol Publications Pvt., Ltd., New Delhi.
3. Gopalakrishnan, T.R., 2007. Vegetable Crops, New India Publishing Agency, New Delhi.
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5. Vishnu Swarup, 2006. Vegetable Science and Technology in India. Kalyani Publishers, New Delhi.
6. Neeraj Pratap Singh . 2005. Basic Concepts of Vegetable Science, International Book Distributing Co., New Delhi.
7. Rai, N. and D.S. Yadav, 2005. Advances in Vegetable Production: Research Book Centre, New Delhi.
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10. Bose, T. K, Kabir, J., Maity T. K., Parthasarathy V. A., and Som M. G., 2002. Vegetable Crops Vol. I, II & III, Kolkata.
11. Veeraraghavatham. D., M Jawaharlal and Seemanthini Ramdas. 1991. A Guide on Vegetable Culture., A. E. Publication, Coimbatore.
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