## B.Sc.(Horticulture) Syllabus
### I Year I Semester

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FSC 101 FUNDAMENTALS OF HORTICULTURE 2 + 1

Aim
   ❖ To teach the basic and fundamental aspects of horticulture

Theory

Unit I Basic concepts of horticulture
   Scope and importance – Global scenario of horticultural crops- Divisions of horticulture - area and production – export and import - classification of horticultural crops – Nutritive value of horticultural crops – horticultural therapy – Horticulture Zones of India and Tamil Nadu – Horticultural developmental agencies

Unit II Soil and climatic factors on crop production
   Influence of soil – physical and chemical properties and climatic factors – light, temperature, photoperiod, relative humidity, rainfall, micro climate, pollution – influence of biotic and abiotic stresses on crop production

Unit III Nursery techniques and cropping systems

Unit IV Growth and development
   Important phases of growth and development - bearing habits - Principles and methods of pruning and training of horticultural crops- rejuvenation of old and senile orchards- factors influencing fruitfulness and unfruitfulness – special horticultural practices
Unit V Protected cultivation and post harvest handling

Protected cultivation – principles of organic horticulture – hydroponics - harvesting and post harvest handling – processing, value addition, storage and marketing of horticultural produce.

Practical


Lecture schedule

1. Scope, importance and divisions of Horticulture
2. Global and national scenario of area, production, export and import of horticultural crops
3. Classification and Nutritive value of horticultural crops
4. Horticultural therapy
5. Horticulture zones of India and TamilNadu
6. National and state level agencies involved in Horticultural development
7. Role of soil – physical and chemical properties in horticultural crop production
8. Role of climatic factors in horticultural crop production
9. Biotic stress and management in horticultural crops
10. Abiotic stress and management in horticultural crops
11. Nursery techniques and production of healthy planting materials
12. Vegetable gardens – nutrition garden, kitchen garden and other types of gardens
13. Planning, layout and management of an orchard
14. Planting systems and planting
15. After cultural practices and clonal orchards
16. Growth regulators and their role in horticulture crops
17. Mid semester examination
18. Water management including drip irrigation and fertigation system in horticultural crops
19. Weed management in horticultural crops
20. Nutrient management and fertigation in horticultural crops
21. Soil fertility management and fertigation in horticultural crops
22. Cropping systems – intercropping and multi-tier cropping and mulching
23. Growth and development including bearing habits of horticultural crops
24. Principles and methods of training in horticultural crops
25. Principles and methods of pruning in horticultural crops
26. Factors influencing fruitfulness and unfruitfulness in major horticultural crops
27. Rejuvenation of old, unproductive orchards
28. Special horticultural practices
29. Protected cultivation in horticultural crops
30. Organic horticulture
31. Hydroponics in horticultural crops
32. Harvesting and post harvest handling of horticultural crops
33. Processing and value addition of horticultural crops
34. Marketing and storage of horticultural crops

**Practical schedule**

1. Study of different features of an orchard
2. Planning and layout of orchard
3. Planning and layout of orchard – Advanced
4. Tools and implements used in cultivation
5. Layout of nutrition garden
6. Preparation of nursery bed and sowing of vegetable seeds
7. Preparation of pits and planting of fruit plants
8. Layout of different irrigation systems and irrigation methods
9. Preparation of fertilizer mixtures and method of application
10. Preparation and application of growth regulators
11. Identification and correction of nutritional and physiological disorders
12. Study of bearing habits in horticultural crops
13. Methods of training and pruning in horticultural crops
14. Observation of structures used in protected cultivation and storage structures
15. Study of maturity standards, harvesting, grading, packing and storage of horticultural crops
16. Visit to private orchards and cold storage unit
17. Practical Examination

Outcome

After completion of this course, the students will acquire basic knowledge about the fundamental aspects of horticulture. The students in turn will find it easier to undergo other horticultural courses in the following semesters.

Text Books


Further reading


e Reference
- [http://aggie-horticulture.tamu.edu/propagation/propagation.html](http://aggie-horticulture.tamu.edu/propagation/propagation.html)
- [http://www/britannica.com/](http://www/britannica.com/)
- [http://www.horticultureworld.net/hort-india.htm](http://www.horticultureworld.net/hort-india.htm)

**Journals**
- Indian Horticulture
- Acta Horticulture
- Indian Journal of Horticulturae
- Scientia Horticulturae
- Journal of Horticulture Sciences and Biotechnology
VSC 101 BOTANY OF HORTICULTURAL CROPS 1+1

Aim

- To teach basic and fundamental aspects on botany of the horticultural crops.

Theory

Unit I


Unit II

Botany, 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).

Unit III

Botany, 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).
Unit IV

Botany, 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).

Unit V

Botany, 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

Observation and recording 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.

Lecture schedule

1. Systematic botany-principles involved in nomenclature.
2. Terminology, morphological description and classification based on root, stem, leaf, inflorescence, flower and fruit.
4. Anacardiaceae (mango, cashew), Rutaceae (acid lime, sweet orange and mandarin) and Musaceae.
5. Moraceae, Vitaceae, Caricacea, Euphorbiaceae (aonla, cassava, rubber), Myrtaceae (guava, clove) and Sapotaceae.
6. Bromeliaceae, Punicaceae, Annonaceae (custard apple), Rhamnaceae and Rosaceae (apple, pear, plum, rose).
7. Solanaceae (tomato, brinjal, chilli, potato) and Malvaceae.
8. Cucurbitaceae (pumpkin, watermelon, muskmelon, ridge gourd, bitter gourd, cucumber).
9. Mid-semester examination.
10. Moringaceae and Fabaceae (peas, French beans) and Alliaceae (onion, garlic).
11. Brassicaceae (cabbage, cauliflower, radish), Chenopodiaceae and Amaranthaceae.
12. Convolvulaceae, Umbelliferae, Araceae (elephant foot yam, colocasia) and Dioscoreaceae (yam, medicinal dioscorea).
13. Piperaceae (pepper, betelvine) Zingiberaceae (cardamom, turmeric, ginger), Orchidaceae (vanilla, dendrobium orchid) and Apiaceae (coriander).
15. Camelliaceae, Rubiaceae, Palmae (coconut, arecanut, palmyrah, oil palm), Sterculiaceae.
16. Oleaceae (malligai, mullai, jathimalli), Asteraceae (chrysanthemum, marigold, marikulundu, gerbera, golden rod, aster, pyrethrum), Amaryllidaceae and Acanthaceae.
17. Caryophyllaceae, Iradiaceae, Apocynaceae, Graminae, (lemon grass, citronella, palmarosa, vetiver), Geraniaceae, Labiatae (coleus, patchouli, mint, maruvu) and Scrophulariaceae.

Practical schedule

Observation and description of the taxonomy and morphological characters of the crops in the families

1. Anacardiaceae (mango, cashew), Rutaceae (acid lime, sweet orange and mandarin) and Musaceae.
3. Euphorbiaceae (aonla, cassava, rubber), Myrtaceae (guava, clove) and Sapotaceae.
4. Bromeliaceae, Punicaceae, Annonaceae (custard apple), Rhamnaceae and Rosaceae (apple, pear, plum, rose).
5. Solanaceae (tomato, brinjal, chilli, potato) and Malvaceae.
6. Cucurbitaceae (pumpkin, watermelon, muskmelon, ridge gourd, bitter gourd, cucumber).
7. Moringaceae and Fabaceae (peas, French beans) and Alliaceae (onion, garlic).
8. Brassicaceae (cabbage, cauliflower, radish), Chenopodiaceae and Amaranthaceae.
9. Convolvulaceae, Umbelliferae, Araceae (elephant foot yam, colocasia) and Dioscoreaceae (yam, medicinal dioscorea).
10. Piperaceae (pepper, betelvine) Zingiberaceae (cardamom, turmeric, ginger), Orchidaceae (vanilla, dendrobium orchid) and Apiaceae (coriander).
12. Camelliaceae, Rubiaceae, Palmae (coconut, arecanut, palmyrah, oil palm) and Sterculiaeae.
13. Oleaceae (malligai, mullai, jathimalli), Amaryllidaceae and Acanthaceae.
14. Asteraceae (chrysanthemum, marigold, marikolundu, gerbera, golden rod, aster, pyrethrum)
15. Caryophyllaceae, Iradiaceae, Apocynaceae and Geraniaceae
16. Graminae (lemongrass, citrononella, palmarosa, vetiver), Labiatae (coleus, patchouli, mint, maruvu) and Scrophulariaceae
17. Practical examination.

Outcome
The students will learn the basics of botany and the botanical terms in relation to horticultural crops. This fundamental course will help students to understand the course on breeding of horticultural crops.
This course will help students to understand the course on morphology and diagnostic characters of plants/families and in turn, it will help to undertake the breeding of the horticultural crops.

**Text books**


*e references*

- [http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookDiversity_6.html](http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookDiversity_6.html)
- [http://waynesword.palomar.edu/index.htm](http://waynesword.palomar.edu/index.htm)
SAC 101 PRINCIPLES OF ANALYTICAL CHEMISTRY

Aim

This course aims to introduce concepts and principles of analytical techniques among undergraduate students. It also provides opportunity to develop skill of students in various analytical techniques.

Theory

Unit I

General principles of analytical chemistry – common analytical methods – qualitative and quantitative analysis – accuracy and precision of analytical results - Preparation of laboratory reagents.

Unit II


Unit III


Unit IV

Instrumental analysis – principles and practices of potentiometry, conductometry, colorimetry, spectrophotometry, absorption and emission spectroscopy and chromatography – choice of analytical methods.

Unit V


Practical

Potentiometry – Conductometry - Colorimetry - Spectrophotometry - Turbidimetry - Flame Photometry - Atomic absorption spectrophotometry - Radioactivity.

Lecture schedule

1. General principles in analytical chemistry - common analytical methods - quantitative and qualitative analysis - Accuracy and precision of analytical results.
2. Preparation of laboratory reagents - digestion and distillation techniques.
6. Theory of acidimetry, alkalimetry, oxidometry, complexometry and thiocyanometry - titration curve.
9. Mid semester examination
10. Filtration and choice of filters - washing - washing solutions and washing technique.
11. Instrumental methods of analysis - Principles and practices of potentiometry, conductometry, colorimetry & spectrophotometry.
12. Principles and practices of absorption and emission spectroscopy
13. Principles and practices of chromatography - Paper chromatography, Gas Chromatography, TLC, HPLC and HPTLC.
15. Radiation - detection and measurement of radio activity - radiological safety.
17. Use of radioactive and stable isotopes in analytical applications.
Practical schedule

1. Study of common laboratory glassware and apparatus - do’s and don’ts in the laboratory - Part – I
2. Study of common laboratory glassware and apparatus - do’s and don’ts in the laboratory - Part – II
4. Volumetric analysis - Preparation of primary, secondary standards and indicators
5. Acidimetry – Standardization of bases
6. Alkalimetry – Standardization of acids
7. Permanganimetry – Standardization of KMnO4
8. Dichrometry- Standardization of Ferrous Sulphate
9. Iodimetry – Estimation of Copper
10. Complexometry- Estimation of Calcium and Magnesium
11. Potentiometry and Conductometry - Determination of pH and EC
12. Spectrophotometry- Determination of phosphorus in matrices
13. Turbidimetry -Estimation of Sulphur
14. Flame Photometry - Estimation of Potassium
15. Absorption spectrophotometry –Estimation of Fe / Zn / Mn / Cu
16. Detection and measurement of radioactivity using Geiger Muller (GM) Counter
17. Practical Examination
Outcome

The students will gain knowledge on concepts and principles of analytical techniques. They will also acquire skills in various analytical techniques. Further, the knowledge gained will form as building block for many research works.

Text books

e references
- http://www.tutornext.com/ws/rock-type-chart
Aim

❖ To acquaint students with the basic laboratory techniques and tools of microbiology.
❖ To introduce the fundamental characteristics of various microorganisms.
❖ To enable better understanding of students about the microscopic world around them.
❖ To enlighten the students with the knowledge of microbial diversity in soils.
❖ To highlight the role of soil microorganisms in soil fertility and plant growth promotion.
❖ To develop experimental skills in soil microbiology which, include isolation of beneficial microorganisms from soil and plant and their mass production.

Theory

Unit I History and scope of microbiology and bacterial cell structure

   Definition and scope - Spontaneous generation theory. Contributions of Anton Von Leeuwenhoek, Louis Pasteur, John Tyndall, Robert Koch, Edward Jenner, Joseph Lister, Beijerinck, Winogradsky and Waksman; Position of microorganisms in living world; Prokaryotes Vs Eukaryotes; Groups of microorganisms; Bacterial size, shape and arrangement and morphology; functional anatomy of bacteria; structure and organization of a bacterial cell: Invariant and variant components structure and organization of microbial cell. Morphology of fungi and algae- economic importance

Unit II Microbiological techniques

   Microscopy - principles and types; staining of microorganisms-principles; sterilization and disinfection techniques; principles and methods of sterilization - physical methods – heat, filters, and radiation; chemical methods; isolation of pure culture techniques - enrichment culturing, dilution-plating, streak plate, spread plate methods; preservation of microbial cultures.
Unit III Microbial physiology and metabolism

Bacterial growth, reproduction and factors influencing bacterial growth - Growth curve: environmental condition for growth- nutritional types and metabolic diversity of bacteria; principles of energy generation and carbon metabolism; fermentation-respiration in bacteria- Metabolic diversity in bacteria-overview, outline classification of bacteria - bergey’s manual of systematic bacteriology Edn-II

Unit IV Soil Microbiology

Overview of soil microbiology, definitions- Concepts and scope, discovery, distribution and importance of soil microorganisms in soil fertility - factors affecting the activities of soil microorganisms; Rhizosphere microorganisms and importance; Phyllosphere microorganisms - plant-microbe and microbe-microbe interactions in soil.

Unit V Microbial transformation of nutrients in soil

Microbial transformation of nutrients in soil - carbon, phosphorous and sulphur cycle; nitrogen cycle, biological nitrogen fixation - symbiotic and non-symbiotic microorganisms, Process of nodulation and nitrogen fixation; Silicate and zinc solubilising bacteria - types and importance of biofertilizers in agriculture; mass production and quality control of biofertilizers.

Practical

Microscopy - light microscopes; staining techniques - simple and differential staining; Sterilization - equipment and apparatus used for sterilization; media preparation; isolation and enumeration of soil microorganisms; purification and preservation of microorganisms; morphological and biochemical characters of bacteria.

Qualitative analyses of soil microbial profile - organic matter decomposition - measurement of CO₂ evolution; Isolation of N₂ fixing and phosphate solubilizing microorganisms; infection by Arbuscular mycorrhizae; Winogradsky column - mass production of bacterial biofertilizers - mass production of algal and fungal biofertilizers; demonstration of antibiosis.
Lecture schedule

1. Definition and scope of microbiology - Spontaneous generation theory.
3. Position of microorganisms in living world; Prokaryotes Vs Eukaryotes.
4. Bacterial morphology - arrangement of cells, structures.
5. Functional anatomy and reproduction in bacteria.
7. Morphology of algae and their economic importance.
8. Microscopy: principles - different types of microscopy.
10. Sterilization – principle – physical and chemical methods.
12. Environmental conditions for growth – Temperature – psychrophiles, mesophiles and thermophiles; air – aerobic and anaerobic; pH- acidic and alkali; salt.
15. Respiration – fermentation.
17. Mid semester examination
20. Diversity of soil microorganisms-bacteria, actinomycetes, fungi and algae- factors influencing the microbial diversity.
22. Factors affecting the activities of soil microorganisms.
23. Rhizosphere microorganisms- R: S ratio and importance.
24. Plant growth promoting rhizobacteria; Phyllosphere microbiology and Methylotrophs.
25. Microbial interactions in soil - neutralism, positive and negative interactions.
26. Microbial transformation of nutrients in soil – Carbon cycle.
27. Organic matter decomposition- aerobic and anaerobic - Importance of C: N ratio in
soil fertility - humus formation.

28. Microbial transformation of nutrients in soil – Nitrogen

29. Biological nitrogen fixation - symbiotic and non-symbiotic microorganisms.

30. Process and genetics of nodulation and nitrogen fixation.

31. Microbial transformation of nutrients in soil - Phosphorous & Sulphur.

32. Silicate and Zinc solubilizing microorganisms; Mycorrhizae.

33. Types of biofertilizers and importance in agriculture.

34. Production and quality control of biofertilizers and methods of application of biofertilizers.

**Practical schedule**

1. Microscopes- handling light microscope.
2. Staining techniques-Simple and Differential staining
3. Sterilization-equipment and apparatus used for sterilization
4. Media preparation for bacteria, fungi and actinomycetes
5. Enumeration of soil microorganisms- serial dilution plate technique (bacteria, fungi, and actinomycetes)
6. Purification and preservation of bacteria & fungi
9. Conn’s direct microscopic count and Burried slide technique.
10. Organic matter decomposition - measurement of CO$_2$ evolution.
11. Demostration of antibiosis – crowded plate assay
12. Isolation of symbiotic N$_2$ fixing microorganism – Rhizobium
13. Isolation of associative and non symbiotic N$_2$ fixer: *Azospirillum* and *Azotobacter*
15. Assessment of AM fungi colonization in crop plants
16. Mass production of biofertilizers
17. Practical examination

**Outcome**
Skill development in the safe handling, culturing, and staining of microorganisms.

Learning the laboratory procedures needed to identify a bacterial culture.

Acquiring knowledge about the factors that influence microbial growth and how it can be controlled.

Gaining of knowledge of microorganisms in soil by students.

Learning the contribution of soil microorganisms in soil fertility and plant growth promotion.

Acquiring experimental skills in Soil microbiology which includes isolation of beneficial microorganisms from soil and plant and their mass production.

**Text books**


**e Reference**

- [http://www.microbes.info](http://www.microbes.info)
- [http://aem.asm.org](http://aem.asm.org)
- [http://microbelibrary.com](http://microbelibrary.com)
- [http://www.rapidmicrobiology.com](http://www.rapidmicrobiology.com)

Kenneth Todar, U. of Wisconsin-Madison, Department of Bacteriology. URL ([http://www.textbookofbacteriology.net/](http://www.textbookofbacteriology.net/)).
MAT 111 APPLIED MATHEMATICS 1 + 1

Aim

❖ To understand and apply fundamental concepts of mathematics applicable in biology and to acquire about theoretical concepts of algebra, geometry, calculus and mathematical modelling.

Theory

Unit I Algebra


Unit II Analytical geometry

Review of various forms of equations of a straight line. Circles – standard and general forms of equation of a circle – Conic sections - parabola, ellipse and hyperbola in standard forms (without proof).

Unit III Differential calculus

Definition – methods of differentiation. Geometrical and physical meaning of the derivative - higher order derivatives- applications of differentiation. partial differentiation –Homogeneous functions and Euler’s Theorem (without proof). Increasing and decreasing function-maxima and minima of single and several variables without constraints- physical and economic optima- applications in agriculture.

Unit IV Integral calculus

Definition of integration-indefinite and definite integrals-formulae-methods of integration - substitution, method of partial fractions-integration by parts -Simple applications in finding the area and volume by integration.

Unit V Mathematical modelling in agriculture
Mathematical models – system – types of models and their uses in agriculture – fitting of linear, quadratic, exponential and logistic models to data from agricultural field experiments.

**Practical**


Problems in differentiation - maxima and minima of single and several variables without constraints - physical and economic optima-finding the fertilizer dosage for maximum yield and maximum profit. Simple problems in methods of integration computation of area, volume using definite integrals. Problems in fitting linear, quadratic, exponential and logistic models to data from agricultural experiments.

**Lecture schedule**

1. Permutation and combination-meaning of nPr and nCr-simple problems
2. Arithmetic, Geometric and Harmonic progression.
4. Inverse of a matrix by adjoint method.
5. Solution of simultaneous equations by Cramer’s rule & inverse method.
6. Various forms of equation of a straight line, general forms of the equation of a circle.
7. Equations of conic (parabola, ellipse and hyperbola) in standard forms(without proof)
9. Mid semester examination.
10. Partial differentiation –Homogeneous functions and Euler’s Theorem (without proof).
11. Increasing and decreasing function - Maxima and minima of single variables - Physical and Economic optimum - Applications in agriculture - finding the fertilizer dosage for maximum yield and maximum profit.
12. Maxima and minima of several variables without constraints.
13. Integration - methods of integration and definite integrals
15. Mathematical models - Types of models and their uses in Agriculture
16. Linear and Quadratic models - their applications in agriculture.
17. Exponential and Logistic models - their applications in agriculture.

**Practical schedule**

1. Simple problems in permutation and combination and its applications.
2. Problems Arithmetic, Geometric and Harmonic progression
3. Problems in Matrix Algebra and determinants.
4. Inverse of a matrix by adjoint method
5. Solution of simultaneous equations by Cramer’s rule & Inverse method.
6. Problems in equation of a straight line and finding the center and radius of a circle
7. Simple problems in parabola, ellipse and hyperbola.
9. Problems in Partial differentiation - Homogeneous functions and Euler’s Theorem
10. Problems in Increasing and decreasing function - Maxima and minima of single variables.
11. Physical and Economic optimum - Finding the fertilizer dosage for maximum yield and maximum profit.
12. Problems in Maxima and minima of several variables without constraints.
13. Simple problems in methods of integration and applications of definite integrals
15. Problems in fitting linear and quadratic models to data from agricultural experiments
16. Problems in fitting Exponential and Logistic models to data from agricultural experiments

17. Final practical examination

Outcome

Students will acquire knowledge in basic techniques that are applicable to agricultural sciences. Further the course will provide them good introduction to various mathematical models used in biological sciences.

Text Books


References

5. Ranganathan.C.R. 2006, A First Course in Mathematical Models of Population Growth (with MATLAB programs), Associated publishing company, New Delhi

E Reference

- [www.mathworld.com](http://www.mathworld.com)

E Journals

- [http://www.math.neu.edu/~Suciu/journals.html](http://www.math.neu.edu/~Suciu/journals.html)
COM 111 FUNDAMENTALS OF INFORMATION TECHNOLOGY 1 + 1

Aim

- To understand the building blocks of computer system (hardware and software) and its functions, networking basics, internet and web utilities and acquire the skill of programming using C programming language.

Theory

Unit I Introduction to computers and operating systems

Computer system – hardware: input devices, output devices – Software : system software - application Software - utility Software - Virus: types of virus – virus preventive and corrective measures - operating system: Building blocks of a generic operating system – Types of operating system – disk operating System (MS-DOS 8.0) - Windows 7 operating system.

Unit II Computer networks


Unit III Internet and web utilities

Internet Vs Intranet – Browser – Universal Resource Locator (URL) - World Wide Web (WWW) – Search Engine - e-Mail Servers – e-Mail services: Create, Forward, Reply, Attachment, Carbon Copy (CC), Blind Carbon Copy (BCC) - Introduction to Agricultural websites.

Unit IV Office automation

CREATE, INSERT, SELECT, UPDATE and DELETE statements - Microsoft Access 2010 - Query Wizard - Query Design - Open Source office automation software - Introduction to Open Office 3.x.

**Unit V Programming in C**

Programming in C - C Compiler - compilation and execution - structure of a C program - data types - constants and variables - Operators: arithmetic operators, relational operators, logical operators, increment and decrement operators - input and output statements - decision making and branching statements: If, If...else and switch - looping statements: While, do...while and for.

**Practical**

Computer innards: CPU, RAM, ROM, hard disk drive, display, keyboard and mouse - Operating system: MS-DOS 8.0 and Windows 7 working environments - virus troubleshooting - Word processor software - Microsoft Word 2010 - document creation - formatting a document - document conversion: PDF to Word - Word to PDF. Spreadsheet software - Microsoft Excel 2010 - Creation of worksheets, insertion of worksheets, rows and columns - Creating bar and pie charts - Presentation software - Microsoft PowerPoint 2010 - creating presentation - slide show and animation - DBMS - Microsoft Access 2010: create database, create table, insert rows into a table, select rows from a table, update data in a table, delete rows in a table - search engines: simple and advanced searching - e-mail server - creation of e-mail: create, reply, forward, attachment and download options - C program to print the formatted text - C program to perform basic arithmetic operations.

**Lecture schedule**


4. Introduction to Computer Network – Types of Network – LAN, MAN, WAN, WLAN - Basic networking devices: Hub, Switch, Router, Wi-Fi Hotspot


7. e-Mail Servers – e-Mail services: Create, Forward, Reply, Attachment, Carbon Copy (CC), Blind Carbon Copy (BCC) - Introduction to Agricultural websites.


9. Mid Semester Examination


11. Presentation Software - Microsoft PowerPoint 2010 - Views - Slide Layout - Slide Design – Create presentation – Slide show – Animation

12. Database Management System (DBMS) – Table – Row - Column – Structured Query Language (SQL) – ANSI SQL Vs MS Access SQL – CREATE, INSERT, SELECT, UPDATE and DELETE statements


14. Programming in C - C Compiler - Compilation and Execution - Structure of a C program - Data types – Constants and variables

15. Operators: Arithmetic operators, Relational operators, Logical operators, Increment & Decrement operators
16. Input and Output statements - Decision making and branching statements: If, If…Else and Switch
17. Looping statements: While, Do…While and For.

**Practical schedule**

1. Keying practice using online/offline keyboard tutor software
2. Familiarizing working environment of MS DOS 8.0
3. Familiarizing working environment of Windows 7 Operating System
4. Troubleshooting computer viruses by using an Anti-virus software
6. Document conversion using Word to PDF and PDF to Word softwares
8. Creating Bar and Pie charts using Microsoft Excel 2010
10. Working with animation and slideshow using Microsoft PowerPoint 2010
11. Creation and manipulation databases and tables in Microsoft Access 2010
12. Updating and Deleting a row in a Table using Microsoft Access 2010
13. Simple and Advanced searching of web and retrieving articles from open access agricultural journals
14. Creating e-Mails: Create, Reply, Forward, Attachment, CC and BCC and Download options
15. Write a C program to print a formatted text.
16. Write a C program to perform basic arithmetic operations.
17. Final practical examination.

**Outcome**

After completing this course, the student must demonstrate the knowledge and ability to

1. Understand and identify the integral components of a computer system.
2. Familiarize the working environment and applied knowledge of Windows Operating System 7.
3. Understand the basic computer security and gain applied knowledge of troubleshooting computer viruses.

4. Understand the basics of computer networks and gain applied knowledge of working with wired and wireless network environments.

5. Gain applied knowledge of internet, email and web access utilization.

6. Familiarize the working environment of office automation softwares and gain applied knowledge of working with Microsoft Office 2010.

7. Familiarize the fundamental programming constructs and gain applied knowledge of coding using C programming language.

Text books


Reference

3. Rajaraman, V, Computer Programming In C, PHI Learning, Easter Economy Editions

e Reference

- http://www.office.microsoft.com
- http://openoffice.org
- http://www.grassrootsdesign.com/
- http://linux.org
- http://www.doaj.org
ENG 101 ENGLISH FOR EFFECTIVE COMMUNICATION 0 + 1

Aim

- To impart proficiency in English language skills *viz.*,

**Listening:** To impart different kinds of listening and process of listening - interactive listening - listening cloze

**Speaking:** To enable learners to learn English phonemes - stress and intonation - speaking skill - dialogue and monologue

**Reading:** To facilitate learners to internalize reading strategies and skills pertaining to technical texts

**Writing:** To impart the mechanics of writing skills - types of writing - exercise science writing

Practical

**Unit I Listening skill**

Introduction to listening, - kinds of listening, process of listening, - listening mechanism listening TOEFL, IELTS, BEC

**Unit II Reading skill**

Reading: skimming, scanning, SQ3R, intensive reading, extensive reading, critical reading, Cloze texts for integrated grammar and vocabulary, including subtle differences between synonyms, reading comprehension texts for civil service exams, Bank P.O. exams, IELTS, TOEFL and GRE

**Unit III Speaking skill**

English phonemes - stress, intonation and rhythm - genres of speaking, techniques of speaking - public speaking (welcome address, vote of thanks, extempore talk)

**Unit IV Writing skill**

Mechanics of writing, writing genres, five types of writing, précis paragraph writing, essay writing- issue- based writing and argument based writing
Unit V Integrated skills

Note-taking, note-making, summarizing, brainstorming and simulation

Practical schedule

1. Introduction to listening - kinds of listening and process of listening
2. English phonemes
3. Stress, intonation and rhythm
4. Introduction to speaking skill - dialogue and monologue
5. Reading strategies - skimming and scanning - Critical reading
6. Introduction to writing - basic grammar in writing
7. Genre - mechanics of writing
8. Welcome address, vote of thanks, and extempore talk
9. Mid-semester examination
10. Listening comprehension and reading comprehension - (five levels of comprehension viz., factual, inferential, referential, global and attitudinal)
11. Cloze texts - grammar and vocabulary in discourse
12. Listening cloze & Reading cloze
13. Brainstorming, simulation for integrated skills
14. paragraph writing and essay writing
15. Précis writing and summarizing and Integrated skills: SQ3R, factual writing and summarizing note taking, note making
16. Orientation to TOEFL, IELTS & BEC.
17. Practical exam

References


e Reference

- [www.esl-lab.com](http://www.esl-lab.com)
- [www.eflweb.com](http://www.eflweb.com)
- [www.teachingenglish.org.uk](http://www.teachingenglish.org.uk)
- [www.eaays.com](http://www.eaays.com)
- [www.onestopenglish.com](http://www.onestopenglish.com)
PED 101 PHYSICAL EDUCATION 0 + 1

Practical

(17 practical classes - 2 hours-each class-17 classes will be converted into 40 practical hours and 2 hours for evaluation)

I Semester (20 hours)

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

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

Basic gymnastic exercises-participation of athletic events-running, throwing and jumping events

Skill development in anyone of the following games

Warming up, suitable exercise, lead up games, advance skill for all the games

Basket ball : Dribbling, pass, two or three men pass, pivot, lay up shot, shooting, pass break, hook pass, screening, positional play, defence and offence tactics

Volley ball : Fingering, under arm, pass, over head pass, setting, spiking, back pass, jump pass, stunts, elementary dive, flying dive, roll, blocking and various types of services

Ball badminton : Grip, service, foot work, fore hand stroke, back hand stroke, lob, smash, volley, wall practice, spin service and defence tactics

Foot ball : Dribbling, passing, dodging, kicking, heading, screening, chest pass, throwing, dragging, goal kick, defence and offence tactics

Hockey : Grip, bully, dribbling, hitting, drive, push strokes, scoop, flick,
stopping, various types of passes, dodging, defence and offence tactics

**Kho-Kho** : Quadra Ped, Bi-Ped, How to give Kho, taking a direction, recede, parallel toe method, bullet toe method, distal method, foot out, dive, ring game, chains and persue and defence skills

**Chess** : Moves, move of king, move of pawns, move of rooks, move of bishops, move of queen, move of knights, en passant, castling, check and notation

**Kabaddi** : Raid, touch, cant, catch, struggle, various types of defence and offence tactics

**Cricket** : Grip, bowling, spin, leg spin, off spin, medium, batting, dive, sweep, mode of delivery, fielding, rolling etc.

**Tennis** : Grip, Forehand Drive, back hand drive, stroke, backhand ground stroke, service, volley, smash, wall practice, foot work, defence and offence tactics

**Table tennis** : Grip, tossing and serving, spin serve, rally, smash, flick, defence and offence tactics

**Shuttle badminton** : Grip, foot work, service, setting, smash, volley, forehand and backhand stroke, back hand serve and defence

**Gymnastics** : Balanced walk, execution, floor exercise, Tumbling, I aerobatics, grip, release, swinging, Parallel Bar exercise, 'Horizontal Bar Exercise, Flic-flack-walk and pyramids
Athletics

**Sprint**: Medium start, long start, bunch start, set, pick up, finish, upsweep, downsweep, placement, receiving and exchanging

**Jumps**: Western roll, belly roll, eastern cut off, Fass Ferry Flop, approach, Take off, Straddle Hitch-kick, hanging, clearance, landing, strides etc.

**Throws**: Grip, momentum, pre shift, sub phase, the wind up, foot work, entry to the turn, shift, angle of release, follow throw, delivery, front cross step, rear cross step, hop step, fuck method Pary obraine, Discoput, rotation, carry and glide

**Hurdles**: Finding lead leg, use of lead leg and trial leg, flight, cleaning, finish. Lead up games, advance skills, and game for anyone of the above games

**II Semester (20 + 2 ½ hours)**

- Rules and regulations of anyone of the games and athletic events.
- Aims and objectives of Yoga-Asanas: i.e. Padmasana, Pujankasana, Sarvangasana, Chakrasana, Dhanurasana, Halasana, Mayurasana and Savasana. Asanas for ailments, back pain, arthritis, abdominal problems, stress, fatigue, insomnia, obesity, circulation, hypertension, varicose veins, respiration, heart, digestion, head aches, depression, addiction and eye problems.
- Mental Balance and Importance-Development of concentration Suriyanamaskar-Advance skills of anyone of the games which were taught in the I Semester.
NSS 101 NATIONAL SERVICE SCHEME 0 + 1

Practical

I Year


II Year


Practical Schedule

I Semester

1. Orientation of NSS volunteers and programme coordinator and programme officers.
2. Origin of NSS in India and its development.
3. NSS motto, symbol and NSS awards.
4. Organizational set up of NSS at Central, State University and college levels.
5. Programme planning – Theme of the year – planning implementation at PC, PO and NSS volunteer level.
6. Visit to selected village - gathering basic data on socio economic status.
7. Participatory rural appraisal – studying the needs of the target group.
8. Visit of urban slum and gathering data on socio economic status.
9. Self involvement and methods of creating rapport with the target group.
10. Awareness campaign on welfare schemes of the central and state government.
11. Formation career guidance group with NSS volunteers and students welfare unit.
12. Cycle rally on environmental protection.
13. Campus development activities – clean environment campaign, formation of plastic free zones.
14 – 16. Campus development, tree planting maintenance and greening the campus cleaning.
17. Practical examination.

II Semester

1. - 3. Motivation of rural and urban youth for formation of SHG (Self Help Groups) in collaboration with Government machinaries and NGOs.
2. Campaign on ill effects of plastics in the adjoining campus areas – Villages / urban areas.
3. Campaign on *Parthenium* eradication.
5. Popularization of biogas and smokeless chula.
6. Demonstration on the use of wind energy and solar energy.
7. Demonstration of water harvesting techniques.
8. Demonstration on soil conservation techniques wherever possible.
9. Campaign on Community health programmes of central and state Government - involving Health department officials.
12. AIDS awareness campaign; campaign on diabetes and healthy food habits and drug abuse
13. Planing formation of blood donors club – involving NGOs.
14. Campaign on gender equality and women empowerment.
15. Campaign on child health care – immunization, food habits and child labour abolition.

III Semester
1. Conducting field days with KVK to popularize improved agro techniques.
2. Conducing seminar / workshop in a nearby village to motivate the youth on agribusiness (involving DEE, KVK, NGO and local agro-entrepreneurs)
3. Campaign on self employment opportunities like Apiculture, mushroom cultivation, Food processing and value addition, production of biocontrol agents and biofertilizers, nursery techniques, seed production, tissue culture, vermicompost, manufacture of small gadgets and agricultural implements as per local needs and feasibility.
5. Training the NSS volunteers on road safety measures in involving traffic wardens and RTO.
6. Training NSS volunteers on First AID and emergency call involving NGOs and organizations like St. John’s Ambulance, Red Cross, etc.,
7. Organizing Road safety rally.
8. Motivating NSS Volunteers on small savings concept and conveying the message to the public through them.
9. Observation of National integration and communal harmony.
10. Campus development and greening activities.
11. Practical examination.

IV Semester
01-03. Visit to orphanages and old age homes to look after their needs.

04. Personality development programmes – Building up self confidence in youth.

05-07. Teaching NSS volunteers on mediation, Yoga and art of healthy living with trained teachers.

08-09. Visit of nearby National Monument / Places of tourist importance and campaign on cleanliness and preservation.

10-11. Exploration of hidden talents of village youth and public on folklore, traditional art, sports, martial arts and cultural heritage.

12-13. Campus improvement activities

14-16. Visit to special camp village and pre camp planning.

17. Practical examination.

1. Besides the above, NSS volunteers will attend work during important occasions like Convocation, Farmers’ day, Sports meet and other University / College functions. NSS Volunteers will attend one special camp in the selected village for a duration of 10 days and undertake various activities based on the need of that village people.

2. For all out door regular activities villages / slums nearby the campus may be selected to avoid transport cost (Cyclable distance).

3. Special camp activity may be carried out in a village situated within a radius of 15 – 20 KM.
EVALUATION

A. Regular activities

60 marks = I Semester 15 marks
II Semester 15 marks
III Semester 15 marks
IV Semester 15 marks

(Written test 10 marks – participation in programmes and behaviour - 5 marks)

80% attendance is mandatory for attending special camp

1. Special camping activities
   : 40 marks

2. Participation in daily activities : 30 marks

3. Special camp activity report : 5 marks

4. Viva voce on the 10th day of the special camp : 5 marks

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40 marks
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NCC 101 NATIONAL CADET CORPS 0 + 1

Practical

I Year

General-military history-introduction to NCC-aims of NCC-Principles of NCC. NCC organization. Duties of good citizen-system of NCC training-foot drill-arms drill-Guard of Honour-ceremonial drill-weapon training-first aid-rifle and light machine gun-map reading-civil defence-leadership.

II Year

Drill-weapon drill - weapon training and firing-introduction to national integration-historical - geographical - religions background of India - health and sanitation - aid to civil authorities - civil defence - ecology / nature awareness - map reading - social service-adventure activities - leadership qualities.

I Semester

1. NCC Song-Aims and Motto of NCC-Motivation of cadets.
2. History of NCC and organization of NCC.
3. Foot drill-General and word of command.
5. National Integration-Indian history and culture.
6. Health and Hygiene-Structure and function of a human body, hygiene and sanitation.
7. Social service-weaker sections of our society and their needs.
9. Map reading-Introduction to map and lay out of map.
10. Disaster Mangement Civil defence organization and its duties.
11. Communication-Different types-media.
13. Field engineering-principles and applications, camouflage and concealment.
14. Adventure training introduction, different types.
15. First Aid-Methods and practices.
17. Practical examination.

II Semester
3. Guard of Honour and ceremonial drill.
4. Types of weapon, parts stripping and assessment of light gun.
5. Rifle firing and follow up activities.
7. Awards, different types, ranks of officers and cadets.
8. Map reading-judging distance, conventional signs and uses of compass.
9. Leadership traits, types, perception.
10. Fire fighting, role of NCC during natural hazards.
12. Obstacle training.
13. Health and sanitation-preventable diseases, fractures and types of treatments.
15. Social service- Contribution of youth towards social welfare.
16. First Aid-Snake bite and other common medical emergencies.
17. Practical examination.

III Semester
1. Drill- individual word of command.
2. Weapon training – parts of heavy weapons.
3. Stripping and assembling of heavy weapons.
4. Importance of team work, values, code of ethics.
5. Disaster management during earthquake.
7. Map reading – Camposs and Service Protractor.
8. Aids to civil authority.
9. Section and platoon formation.
10. Social service, NGO’s and their contribution to the society.
11. Roll of NCC cadets in civil administration.
12. Traffic rules and road signs.
14. Dressing of wounds, physical and mental health.
15. Field signals.
16. Air raid warning, file fighting.
17. Practical examination.

**IV Semester**

1. Drill – Foot drill.
2. Formation of squad and squad drill.
3. Man management, morale.
4. Time Management, stress management.
6. Adventure Activities, Trekking camp.
7. Map reading – field to map – map to field – grids and scale systems.
11. Opportunities for NCC cadets in Army and other services.
12. Social service, family planning.
13. Section battle drill.
15. Visit to Wellington, Ooty.
16. Self defence mechanisms.
17. Practical examination.
### Evaluation

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<th></th>
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### I Year II Semester

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<td>FSC 102</td>
<td>Propagation of Horticultural Crops</td>
<td>2 + 1</td>
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<tr>
<td>2.</td>
<td>FSC 103</td>
<td>Production Technology of Tropical and Arid Zone Fruit Crops</td>
<td>2 + 1</td>
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<td>3.</td>
<td>VSC 102</td>
<td>Production Technology of Tropical Vegetable Crops</td>
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<td>4.</td>
<td>AGR 102</td>
<td>Fundamentals of Agricultural Meteorology</td>
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<td>5.</td>
<td>PBG 102</td>
<td>Principles of Genetics and Cytogenetics</td>
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<td>6.</td>
<td>CRP 101</td>
<td>Crop Physiology</td>
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<td>7.</td>
<td>BIC 101</td>
<td>Fundamentals of Biochemistry</td>
<td>2 + 1</td>
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<td>8.</td>
<td>AEC 101</td>
<td>Principles of Agricultural Economics</td>
<td>1 + 1</td>
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Aim

To import skill oriented knowledge on media preparation, propagation method and maintenance and after care of propagated plants.

Theory

Unit I Basics of plant propagation


Unit II 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.

Unit III 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

Unit IV 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 -

**Unit V Techniques of Micro propagation**

Micro propagation – definitions - different methods - protocol of micropropagation - 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 préparations - meristem tip culture - micro grafting - *in vitro* clonal propagation of important horticultural crops - constraints and problems in micropropagation - after care - packing, transport and marketing - infrastructure requirements - establishment of commercial tissue culture units - visit to commercial TC units- status of micropropagation 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.

**Lecture schedule**

1. Scope and importance of plant propagation, different methods, principles and definitions
2. Agencies involved in the development of nursery, government schemes and economics

3. Propagation structures, mist chamber, shade net, phytotron, humidifiers, greenhouse, poly house, hot beds and pit nursery

4. Tools and implements, preparation of growing media, rooting media ratio, soil sterilization, organic manure, coco peat, rooting media pH and containers

5. Sexual and asexual propagation, advantages and disadvantages, factors influencing different methods of propagation

6. Seed propagation, dormancy, viability, germination, longevity, seedling vigour

7. Seed treatments in sexually propagated crops, formation of nursery bed and tray culture

8. Micro and megasporogenesis, apomixes, mono embryony, poly embryony, chimeras and principles

9. Different methods of cutting and layering

10. Anatomical and physiological basis for rooting

11. Grafting methods and techniques

12. Raising rootstocks and maintenance of scion bank

13. Budding methods and techniques

14. Bud wood collection and maintenance

15. Factors influencing the stock-scion relationship

16. Anatomical and physiological basis of bud and graft union

17. Mid semester examination

18. Vegetative propagation, clonal orchard establishment and maintenance and scion bank


20. Propagation through specialized organs *viz.*, tubers, bulbs, corms, bulbils, rhizome, runner, off shoot, crown, slip and sucker.


22. Hardening of plants in nurseries and maintenance
23. Quality management and quality standards
24. Nursery act
25. Packing, transport and marketing of nursery plants
26. Scope and importance of micro propagation
27. Plant tissue culture, definitions, totipotency, cell division, cell cycle,
28. Media preparation, shoot multiplication, growing and rooting media
29. Concepts and commercial production of tissue culture plants
30. Micro propagation – commercially important fruit crops
31. Micro propagation – of commercially important spices, medicinal and aromatic 
crops
32. Micro propagation of commercially important foliage plants, indoor ornamental 
plants and cut flowers
33. Production of disease free planting materials though micro propagation.
34. Constraints and problems associated with micro propagation – after core, 
packing, transport and marketing, Infrastructure requirements, Establishment of 
commercial tissue culture units.

Practical schedule
1. Media and containers for macro propagation, tools and implements -
2. Propagation structures *viz.*, mist chamber, poly house, shade net house, cold 
frames and hot beds and their maintenance
3. Sexual propagation of acid lime, papaya and raising rootstocks in mango - 
   Preparation of nursery beds and sowing
4. Potting, repotting, handling and maintenance of seedling and rootstocks
5. Preparation of growth regulators and standardization of formulations for seed 
   and vegetative propagation.
6. Techniques of propagation through leaf cuttings
7. Techniques of propagation through stem cutting
8. Techniques and methods of layering
9. Techniques and methods of layering
10. Techniques and methods of propagation through grafting
11. Techniques and methods of propagation through grafting
12. Propagation techniques through budding
13. Propagation techniques through budding
14. Propagation through specialized organs
15. Project preparation for commercial nurseries
16. Visit to private nurseries and commercial tissue culture units
17. Final practical examination.

**Outcome**

Students will be benefited with hands on training in media preparation, mother plant selection, propagation techniques and maintenance and after care of propagated plants.

**Textbooks**


Further reading

e References
- http://www.biotech / tissue culture techniques.com

Journals
- Journal of Horticulture Sciences and Biotechnology
- Acta Horticulture
- Plant Cell Reporter
- Indian Journal of Horticulture
FSC 103 Production Technology of Tropical and Arid Zone Fruit Crops 2 + 1

Aim

❖ To impart knowledge on the principles and cultivation of tropical and arid zone fruit crops.

Theory

Unit I 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.

Unit II 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.

Unit III 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.

Unit IV Arid zone fruits - aonla, ber, pomegranate and date palm


Unit V Arid zone fruits - custard apple, jamun, bael, wood apple and manila tamarind

Practical

Description and identification of cultivars/varieties - nursery management - nursery preparation, seed sowing and raising seedlings / rootstocks, practising 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.

Lecture Schedule

1. Fruits cultivation - overview: global, national and regional level. Area, production, and export potential, past and present status of fruits in India
2. General appraisal of fruit growing regions / zones in India and Tamil Nadu - special features of tropical and arid zone fruits - GAP- organic production.
3. Mango - area, production, productivity, species and varieties - varietal classification - specific purpose and exportable varieties. Climate and soil requirements- effect of weather factors on growth, flowering and productivity
5. Flowering, fruit set, bearing problems - special horticultural techniques - Production constraints - physiological disorders - rejuvenation of old orchards

8. Manuring - nutrient deficiency and management - irrigation and weed management - special horticultural techniques

9. Physiological disorders - production constraints - harvesting - post harvest handling - ripening of fruits - storage and processing

10. Papaya - climate and soil requirements - sex forms - varieties - propagation - planting requirements, manures and manuring - nutrient deficiency and management - weed and water management

11. Thinning - use of growth regulators - production constraints - harvesting - latex extraction - postharvest handling - storage - processing.

12. Sapota - climate and soil requirements - varieties - propagation - planting requirements - manures and manuring.


15. Use of growth regulators - bending - bahar treatments - production constraints - harvesting - postharvest handling - storage - processing


17. Mid semester examination

18. Sweet orange - climate and soil requirements - varieties - propagation - planting requirements - training and pruning - manures and manuring - nutrient deficiency and management - weed and water management - use of
growth regulators - production constraints - harvesting - postharvest handling - storage - processing.

19. Jackfruit - climate and soil requirements - varieties - propagation - planting requirements - training and pruning - manures and manuring - nutrient deficiency and management - weed and water management

20. Use of growth regulators - production constraints - harvesting - postharvest handling.

21. Dryland horticulture - importance and scope in India and Tamil Nadu - distribution of arid and semi-arid zones in India and Tamil Nadu.

22. Cropping systems and intercropping - crops suitable for dry land system - spacing and planting patterns for rainfed horticultural crops

23. Special practices - mulching - Soil and moisture conservation methods - chemical application - anti-transpirants for cultivation of arid zone fruits


25. Ber - climate and soil requirements - varieties - propagation - planting density - nutrient, weed and water management - training and pruning - use of growth regulators - production constraints and harvest - grading - postharvest handling.

26. Pomegranate - climate and soil requirements - varieties - propagation - planting density - nutrient, weed and water management training and pruning

27. Growth regulation by chemical regulators and harvest - grading - postharvest handling.

29. Date palm - climate and soil requirements – varieties - production constraints - propagation – planting density – nutrient, weed and water management training and pruning, growth regulation by chemical regulators and harvest - grading – postharvest handling.


32. Bael - climate and soil requirements – varieties – propagation – planting density – nutrient, weed and water management


Practical

1. Study of mango varieties
3. Study of banana varieties and their genome classification and scoring techniques.
5. Study of grapes varieties, training and pruning practices
6. Visit to mango, banana and grapes orchards in Cumbum valley
7. Study of sapota varieties, propagation and planting
8. Study of papaya varieties, propagation and thinning of plants
9. Papain extraction and its cost economics
10. Study of guava propagation techniques and varieties.
11. Acid lime, lemon and sweet orange varieties, suitable root stocks and their propagation
12. Aonla, pomegranate custard apple, Jamun, bael and manila tamarind propagation and varieties
13. Visit to RRS, Aruppukottai
15. Practices in harvesting and postharvest handling
16. Working out the economics of production of tropical fruits and project preparation.
17. Practical examination.

Outcome

1. Practical knowledge on specialized production techniques of tropical and arid zone fruits.
2. Understanding the production constraints through various field visits.

Text Books

Further reading

References
- www.fruits-mg.com
- www.fruits.com
- www.hort.purdue.edu/newcrop/morton
- www.bouquetoffruits.com

Journals
- Punjab Hort. J.
- Acta Hort.
VSC 102 Production Technology of Tropical Vegetable Crops 2 + 1

Aim

- To teach the students about the scenario of vegetable cultivation advanced production techniques and production constraints.

Theory

Unit I 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.

Unit II 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.

Unit III 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.

**Unit IV 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.

**Unit V 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, sweetpotato, 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.

Lecture schedule

1. Area, production, world scenario, industrial importance, export potential of tropical vegetable crops and institutions involved in vegetable crops research.
2. Classification of vegetable crops.
3. Effect of climate, soil, water and nutrients on vegetable crop production and their management.
4. Cropping systems in vegetable crops.
5. Vegetable production in nutrition garden, kitchen garden, truck garden, market garden, roof garden, floating garden, vegetable farming, contract farming, rice fallow cultivation, river bed cultivation, rainfed cultivation.
6. Organic farming – GAP in vegetable production
7. Export standards of vegetables
12. Chilli: Composition and uses - origin and distribution- 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
15. Onion (Aggregatum and Common): Composition and uses- origin and distribution- 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
17. Mid semester examination
expression - use of chemical and growth regulators - cropping system - constraints in production - harvest - yield

19. Snake gourd and ribbed gourd: 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 chemical and growth regulators - cropping system - constraints in production - harvest - yield

20. Ash gourd and pumpkin: 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 chemical and growth regulators - cropping system - constraints in production - harvest - yield


22. Cucumber and gherkin: 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 chemical and growth regulators - cropping system - constraints in production - harvest - yield
23. Water melon and Musk melon: 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 chemical and growth regulators - cropping system - constraints in production - harvest - yield

24. Cluster beans: Composition and uses - 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 chemical and growth regulators - cropping system - constraints in production - harvest - yield

25. Vegetable Cowpea and Lab lab: Composition and uses - 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 chemical and growth regulators - cropping system - constraints in production - harvest - yield


27. Amaranth: Composition and uses - 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
chemical and growth regulators - cropping system - constraints in production - harvest - yield

28. Palak, basella and chekkurmanis: Composition and uses - 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 chemical and growth regulators - cropping system - - constraints in production - harvest - yield

29. Cassava: Composition and uses - area and production- climate and soil requirements - season - varieties and hybrids - seed rate - preparation of field - spacing - planting systems - planting - water and weed management


31. Sweet potato: Composition and uses - area and production- climate and soil requirements - season - varieties and hybrids - seed rate - vegetative propagation - preparation of field - spacing - planting systems - planting - water and weed management - nutrient requirement - fertigation - nutrient deficiencies - physiological disorders- use of chemical and growth regulators - cropping system - - constraints in production - harvest - yield

32. Colocasia and Vegetable coleus: Composition and uses - area and production- climate and soil requirements - season - varieties and hybrids - seed rate - vegetative propagation - preparation of field - spacing - planting systems - planting - water and weed management - nutrient requirement - fertigation - nutrient deficiencies - physiological disorders- use of chemical and growth regulators - cropping system - - constraints in production - harvest - yield

33. Amorphophallus: Composition and uses - area and production- climate and soil requirements - season - varieties and hybrids - seed rate - vegetative propagation - preparation of field - spacing - planting systems - planting - water and weed management - nutrient requirement - fertigation - nutrient deficiencies -
physiological disorders- use of chemical and growth regulators - cropping system - constraints in production - harvest - yield


Practical schedule

1. Preparation of nursery, containerized transplant production and sowing of seeds for solanaceous vegetable crops.
2. Preparation of field and sowing of direct sown vegetable crops.
3. Preparation of field, sowing of cucurbitaceous, perennial and leafy vegetable crops and tuber crops.
4. Identification and description of species and varieties of tomato, brinjal and chilli. Working out cost- benefit ratio.
5. Identification and description of species and varieties of bhendi, amaranth, cluster beans, vegetable cowpea and lab-lab. Working out cost- benefit ratio.
8. Planning and lay out of kitchen/ nutrition garden.
9. Study of rainfed cultivation practices in vegetable crops
10. Study of drip and fertigation, basal dressing, top dressing and foliar spray of fertilizers for vegetable crops.
11. Identification of weeds, preparation of herbicide spray fluids and their usage in the field. Working with the economics of weed management
12. Preparation of growth regulator spray solution- their usage in tropical vegetable crops
13. Identification of nutrient deficiencies, physiological disorders and corrective measures in vegetable crops.
14. Maturity indices, harvesting and seed extraction
15. Visit to commercial vegetable growing area / markets
16. Project preparation for commercial cultivation of tropical vegetable crops.
17. Practical Examination.

Outcome

1. Hands on experience of vegetable cultivation
2. Knowledge about quality requirement and production and techniques for export
3. Managing skill for solving field problems

Text Books


Further Reading


Journals

1. Indian Journal of Horticulture
2. Indian Journal of Vegetable sciences
3. Indian Horticulture
4. International Journal of Vegetable Science
5. Scientia Horticulture
6. Green farming

e References

- [http://www.informaworld.com/smpp/title~db=all~content=g904622674](http://www.informaworld.com/smpp/title~db=all~content=g904622674)
- [http://ucanr.org/freepubs/docs/8129.pdf](http://ucanr.org/freepubs/docs/8129.pdf)
- [http://www.sus-veg-thai.de/](http://www.sus-veg-thai.de/)
- [http://www.amazon.co.uk/Vegetable-Alliums-Production-Science-Horticulture/dp/0851987532](http://www.amazon.co.uk/Vegetable-Alliums-Production-Science-Horticulture/dp/0851987532)
AGR 102 Fundamentals of Agricultural Meteorology 1 + 1

Theory

Unit I Introduction

Meteorology - agricultural meteorology - scope in crop production. Coordinates of India and Tamil Nadu - atmosphere - composition and vertical layers of atmosphere (stratification) - climate - weather - factors affecting climate and weather - climatic types

Unit II Basics of weather parameters and their influence on crop production - Solar radiation, light, temperature, RH, wind


Unit III Atmospheric circulation - clouds, cloud seeding, evapotranspiration


Unit IV Weather analysis - forecast and impact of climate

Agroclimatic zones - agroclimatic normals - weather forecasting - synoptic chart - crop weather calendar - remote sensing and crop weather modeling - Impact of climate and weather on crop production and pest and diseases.

Unit V Introduction to climate change

Climate change - climate variability - definition and causes of climate change - Impact of climate change on agriculture, forestry, hydrology, marine and coastal ecosystem
Practical


Lecture schedule

1. Meteorology - Agricultural Meteorology - Definition, their importance and scope in crop production.
3. Climate and weather - Factors affecting climate and weather. Macroclimate - Meso climate - Microclimate - Definition and their importance - Different climates of India and Tamil Nadu and their characterization.
8. Atmospheric pressure, diurnal and seasonal variation - Pressure systems of the world - causes for variation - Isobar - Low, depression, anticyclone, Tornado, hurricane
9. Mid Semester Examination
10. Wind systems of the world - Inter Tropical Convergence Zones (ITCZ), wind speed in different seasons -. Clouds and their classification - Concepts of cloud seeding – present status.
13. Weather forecasting - Types, importance, Agro Advisory Services - Synoptic chart - Crop weather calendar
14. Remote sensing and its application in agriculture – Crop weather modeling and its application in agriculture – list of models available
15. Effect of weather and climate on crop production, soil fertility and incidence of pest and diseases
16. Climate change, climate variability – definition and causes of climate change including ENSO
17. Impact of climate change on Agriculture, Forestry, Hydrology, marine and coastal ecosystem
Practical schedule

1. Site selection and layout for Agromet Observatory - Calculation of local time - Time of observation of different weather elements - Reviewing agromet registers.
2. Measurements of solar radiation (pyranometers), sunshine hours (sunshine recorder) - working out weekly and monthly mean for graphical representation
3. Measurement of air and soil temperature and grass minimum thermometers and thermographs - drawing isolines
5. Measurement of atmospheric pressure - barograph - Fortein-s barometer - Isobars based on past data for different seasons.
8. Heat Unit concept- GDD, HTU, PTU for fixing time of sowing.
9. Probability analysis of rainfall for crop planning
10. Drawing Synoptic charts for understanding weather.
11. Preparation of crop weather calendars and forecast based agro advisories
12. Preparation pest weather calendar and pest forewarning
13. Estimation of length of growing periods using weekly rainfall data.
14. Water balance studies
15. Identification of efficient cropping zone- RYI, RSI
17. Practical Examination.

References

2. IPCC Fourth Assessment report, 2007 (http://www.ipcc.ch)
PBG 102 Principles of Genetics and Cytogenetics 2 + 1

Aim

- The fundamental concepts of genetics and cytogenetics will be exposed to the students quoting classical examples

Theory

Unit I Cell theory and chromosome morphology


Unit II Mendelian laws of inheritance

Unit III Linkage and crossing over

Linkage - coupling and repulsion; experiment on Bateson and Punnet - Chromosomal theory of linkage of Morgan –complete and incomplete linkage, linkage group.
Crossing over – significance of crossing over; cytological proof for crossing over - Stern’s experiment; factors controlling crossing over. Strength of linkage and recombination; Two point and three point test cross. Double cross over, interference and coincidence; genetic map, physical map.

Unit IV Sex determination and sex linkage


Unit V Modern concepts of genetics


Practical

**Lecture schedule**

1. Definition of genetics, heredity, inheritance, cytogenetics; Brief history of developments in genetics and cytogenetics
2. Physical basis of heredity: Structure and function of cell and cell organelles – Differences between Prokaryotes and Eukaryotes.
4. Chromosome structure, chemical composition, nucleosome, centromere, telomere, NOR, satellite chromosome, karyotype, ideogram, Types of chromosomes based on position of centromere .
5. Special chromosomes – polytene, lampbrush, B, ring and isochromosomes.
7. Chromosomal aberration: Variation in chromosome number – euploid, aneuploid, types of aneuploids and their origin.
8. Polyploid - auto and allopolyploids, their characters; meaning of genome; evolution of wheat, Triticale, cotton, tobacco, Brassicas,
9. Pre-Mendelian ideas about heredity – Vapour and fluid theory, Magnetic power theory, Preformation theory, Lamarck’s theory, Darwin’s theory, Germplasm theory and Mutation theory.
11. Chromosomal theory of inheritance. Allelic interactions – Dominance vs. recessive, complete dominance, codominance, incomplete dominance, over dominance.


13. Deviation from Mendelian inheritance – Non allelic interaction without modification in Mendelian ratio – Batson and Punnet’s experiment on fowl comb shape. Non allelic interaction with modification in Mendelian ratio – i.) Dominant epistasis (12:3:1)

ii.) Recessive epistasis (9:3:4) iii.) Duplicate and additive epistasis ((9:6:1). iv.) Duplicate dominant epistasis (15:1)

v) Duplicate recessive epistasis (9:7) vi.) Dominant and recessive epistasis (13:3);

Summary of epistatic ratios (i)to (vi).

14. Lethal genes, Pleiotrophy, penetrance and expressivity, phenocopy: Multiple alleles, blood group in humans, coat colour in rabbits, self incompatibility in plants; pseudo alleles, isoalleles.

16. Mid semester examination


19. Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers.

20. Linkage - coupling and repulsion; Experiment on Bateson and Punnet – Chromosomal theory of linkage of Morgan – Complete and incomplete linkage, Linkage group.

21. Crossing over – significance of crossing over; cytological proof for crossing over - Stern’s experiment; Factors controlling crossing over.

22. Strength of linkage and recombination; Two point and three point test cross.

23. Double cross over, interference and coincidence; genetic map, physical map.

25. Sex linked inheritance – cris cross inheritance – reciprocal difference; holandric genes; sex influenced and sex limited inheritance.


27. Cytoplasmic inheritance and maternal effects - features of cytoplasmic inheritance, chloroplast, mitochondrial, plasmid and episomic inheritance.

28. DNA, the genetic material - Griffith’s experiment, experiment of Avery, McCleod and McCarthy – confirmation by Hershey and Chase; RNA as genetic material – Frankel, Conrat and Singer experiment.

29. Structure of DNA – Watson and Crick model

30. Proof for semi conservative method of DNA replication; Models of DNA replication; steps involved in DNA replication.

31. RNA types - mRNA, tRNA, rRNA; genetic code, transcription –central dogma of life.


33. Regulation of gene expression – operon model of Jacob and Monad; Structural genes and regulator genes; exons and introns. Modern concept of gene - cistron, muton and recon; complementation test; mobile genetic elements.

34. Mutation – characteristics of mutation – micro and macro mutation – CIB technique - molecular basis of mutation; major physical and chemical mutagens.

**Practical schedule**

1. Use of microscopes and study of cell shapes and cell organelles of active mitotic and meiotic tissues.

2. Principles of killing and fixing; preparation of stains and preservatives.

3. Study of the mitotic phases in root tips of onion / Aloe sp.


5. Procedure for fixing and observing different meiotic phases in the inflorescence of maize.
6. Procedure for fixing and observing different meiotic phases in the inflorescence in pearl millet/sorghum.

7. Induction of polyploidy using colchicine

8. Repetition of meiotic studies in maize/sorghum/pearl millet and making temporary and permanent slides.

9. Principles of dominance, recessive, back cross, test cross, incomplete dominance, codominance and lethal factor; Chi square test; Monohybrid genetic ratio with dominance, with incomplete dominance and test cross;

10. Dihybrid ratio with dominance, with incomplete dominance and test cross

11. Simple interaction of genes-comb character in fowls; Dominant epistasis.

12. Recessive epistasis, Duplicate and additive epistasis.

13. Duplicate dominant epistasis, Duplicate recessive epistasis, Dominant and recessive epistasis.

14. Multiple alleles and polygenic inheritance

15. Estimation of linkage with F2 and test cross data; Coupling and repulsion.

16. Problems on two point test cross and three point test cross; Working out interference, coincidence and drawing genetic maps.

17. Practical examination.

Text books


Further reading


References
CRP 101 Crop Physiology 2 + 1

Aim

- To expose the students to the basic concepts and underlying applications of crop physiology

Theory

Unit I Plant water relations

Importance of crop physiology in agriculture, role of water – water potential and components – Definitions - field capacity, water holding capacity of soil and permanent wilting point, absorption and translocation of water and solutes, transpiration - significance- antitranspirants.

Unit II Nutrio physiology


Unit III Carbon fixation

Photosynthesis - light reaction and photosynthetic pathways - C3, C4 and CAM, differences between C3, C4 and CAM pathways - Factors affecting photosynthesis, photorespiration and significance phloem and xylem loading - source sink relationship.

Unit IV Growth physiology

Growth - growth analysis - LAI, LAD, SLW, SLA, LAR, NAR, RGR and CGR in relation to crop productivity,- - Photoperiodism - role of phytochrome in flowering and regulation of flowering. Vernalisation – devernalisation- plant growth regulators and commercial applications - physiological role of auxins and GA, physiological role of cytokinin, ethylene and ABA - novel growth regulators and retardants - their uses in
crop productivity, post harvest physiology - physiology of seed germination, seed and bud dormancy and breaking methods, parthenocarpy - physiology of fruit ripening - climacteric and non-climacteric fruits - factors affecting ripening and storage, abscission - senescence, shelf life and quality changes - use of PGRs and nutrients.

**Unit V Stress physiology**

Environmental stresses - water stress - physiological changes - adaptation to drought and its amelioration, temperature stress - physiological changes - low and high temperature - chilling injury - tolerance - alleviation, low light and UV radiation stresses - salt stress - physiological changes and alleviation, Global warming – Carbon sequestration - physiological effects on crop productivity.

**Lecture schedule**

1. Importance of Crop Physiology in Agriculture.
2. Role of water - process and significance
3. Definition - field capacity, water holding capacity of soil and permanent wilting point.
4. Translocation of water and solutes - phloem and xylem transport.
5. Transpiration - mechanism - significance - guttation - antitranspirants.
7. Mechanism of uptake - physiological role of nutrients.
8. Foliar diagnosis - nutritional and physiological disorders
9. Foliar nutrition- root feeding, trunk feeding and fertigation
10. Photosynthesis - light reaction
11. Photosynthetic pathways - C₃, C₄ and CAM
12. Differences between C₃, C₄ and CAM pathways - Factors affecting photosynthesis.
13. Photorespiration - photorespiration process and significance of photorespiration.
14. Source sink relationship and their manipulations
15. Photoperiodism - short day, long day and day neutral plantS
17. Mid semester examination
20. Plant growth regulators - Physiological role of Auxins and GA.
21. Physiological role of Cytokinin, and ABA
22. Physiological role of Ethylene
23. Novel growth regulators and retardants and their uses in crop productivity.
24. Seed germination - physiological changes ,seed and bud dormancy, breaking methods
25. Abscission - senescence
26. Physiology of ripening- climatic non climatic and factors affecting ripening and sotorage
27. Role of PGRS and nutrients in shelf life and quality changes
29. Temperature stress - Physiological changes - low and high temperature - adaptation and amelioration
31. Low light and UV radiation stresses – physiological changes - adaptation and amelioration.
32. Salt stress - physiological changes- adaptation and alleviation
33. Global warming – physiological effects of green house gases-
34. Carbon Sequestration - physiological effects on crop productivity

Practical schedule
1. Preparation of solutions
3. Estimation of stomatal index and stomatal frequency.
5. Physiological and Nutritional disorders in crops plants
6. Rapid Tissue Tests for:
7. Estimation of chlorophyll Stability Index
8. Estimation of RWC
10. Estimation of Nitrate reductase activity
11. Growth Analysis - Determination of LAI, LAD, SLA, SLW, LAR, NAR, RGR, CGR and HI.
12. Bioassay of cytokinin
13. Bioassay of GA
14. Estimation of proline accumulation to assess the water stress in crop plants.
15. Demonstration of crop response to growth regulators.
16. Field visit for foliar diagnosis.
17. Practical examination

Outcome
The students will know about the principles, basic and application of crop physiology in agriculture.

References

e Reference
- http://www.plantphys.org
- http://4e.plantphys.net
BIC 101 Fundamentals of Biochemistry 2 + 1

Theory

Unit I  Carbohydrates


Unit II  Lipids


Unit III  Proteins and enzymes


Unit IV  Metabolism

Carbohydrate metabolism - breakdown of starch by amylases, glycolysis and TCA cycle Pentose phosphate pathway. Respiration - electron transport chain and oxidative phosphorylation. Bioenergetics of glucose. Metabolism of lipids - lipases and phospholipases. Fatty acid oxidation and bioenergetics. Biosynthesis of fatty acids and triacyl glycerol. General catabolic pathway for amino acids - transamination,
deamination and decarboxylation. Ammonia assimilating enzymes. Metabolic inter-
relationship.

**Unit V  Secondary metabolites**

Secondary metabolites - occurrence, classification and functions of phenolics, terpenes and alkaloids. Applications of secondary metabolites in food and pharma industries.

**Practical**


**Lecture schedule**

1. Introduction to biochemistry, Carbohydrates-importance and classification.
2. Occurrence and structures of monosaccharides.
3. Structures of disaccharides and polysaccharides.
4. Mutarotation, optical activity and physical properties of sugars.
5. Chemical reactions of carbohydrates, Optical isomerism, Industrial uses
7. Structures of fatty acids and triacyl glycerol, essential fatty acids.
8. Phospholipids and their importance.
9. Waxes, plant pigments, sterols and industrial applications of lipids.
11. Amino acids -classification and properties, essential amino acids.
15. Enzymes - classification.
17. Mid semester examination.
18. Factors affecting enzyme action and competitive, non-competitive and Uncompetitive inhibition.
20. Breakdown of starch.
22. TCA cycle and its energetics.
23. Pentose phosphate pathway.
25. Bioenergetics of glucose.
26. Lipases and phospholipases.
27. β-oxidation of fatty acids and energetics of β-oxidation.
28. Fatty acid and triacyl glycerol biosynthesis.
29. Transamination, deamination and decarboxylation.
30. Ammonia assimilating enzymes, GDH, GS and GOGAT.
31. Metabolic interrelationship.
32. Secondary metabolites - occurrence, classification and functions of phenolics.
33. Occurrence, classification and functions of terpenes.
34. Occurrence, classification and functions of alkaloids ; Applications of secondary metabolites in food and pharma industries.
Practical schedule

1. Qualitative tests for carbohydrates.
2. Estimation of total sugars.
3. Determination of reducing sugars
5. Estimation of starch
6. Colour reactions of amino acid and proteins.
7. Estimation of proteins. by Biuret method
8. Sorenson’s formal titration of amino acids.
10. Estimation of free fatty acids of an oil.
11. Determination of iodine number of an oil.
12. Estimation of ascorbic acid.
14. Assay of amylase
15. Separation of amino acids through PC.
16. Separation of sugars through TLC.
17. Final practical examination.

Text books


Further reading


e Reference

AEC 101 Principles of Agricultural Economics 1 + 1

Theory

Unit 1 Nature and scope of economics


Unit II Theory of consumption


Unit III Theory of production


Unit IV Theory of distribution


Unit 5 Macroeconomic concepts

Practical


Lecture schedule

1. Nature and scope of economics: Importance – Subject matter, science vs. art, positive vs. normative science - deductive and inductive methods - Different economic systems: merits and demerits.
5. Demand: Definition - Kinds of demand, Demand schedule, Demand curve, Law of demand, Determinants of demand - Extension and contraction Vs Increase and decrease in demand.


7. Engel’s law of family expenditure - Consumer’s surplus: Definition – Importance.


9. Mid-semester examination.


12. Capital - characteristics of capital - capital formation - Entrepreneur, characteristics and functions of entrepreneur.


**Practical schedule**


2. Exercise on Law of Equi Marginal Utility.
3. Demand schedule - graphical derivation of individual and market demand.
4. Indifference curve analysis – properties, budget line and consumer equilibrium.
5. Measurement of arc elasticity and point elasticity of demand - Estimation of own price elasticity, income and cross elasticity of demand.
7. Exercise on law of diminishing marginal returns – relationship between TPP, APP and MPP.
8. Cost concepts and graphical derivation of cost curves.
9. Analysis of growth in population and food grain production in India.
10. Estimation of supply elasticity.
13. Types and functions of money.
15. Analysis of trends in National Income and study of structural changes in the economy
16. Exercise on welfare indicators – HDI, PQLI, PPP, Poverty Line, etc
17. Practical examination.

Reference books

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<td>VSC 201</td>
<td>Production Technology of Temperate Vegetable Crops</td>
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<tr>
<td>2.</td>
<td>AGR 211</td>
<td>Weed and Water Management in Horticultural crops</td>
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<td>3.</td>
<td>SAC 201</td>
<td>Fundamentals of Soil Science</td>
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<td>AEN 201</td>
<td>Fundamentals of Entomology</td>
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<td>SST 211</td>
<td>Principles of Seed Production and Quality control in Horticultural Crops</td>
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<td>6.</td>
<td>PAT 201</td>
<td>Fundamentals of Plant Pathology</td>
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<td>AMP 201</td>
<td>Livestock and Poultry Production Management</td>
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VSC 201 Production Technology of Temperate Vegetable Crops 2 + 1

Aim

- To teach the students about the scenario of vegetable cultivation advanced production technologies and post harvest handling, production constraints of vegetables.

Theory

Unit I Overview

Area, production, world scenario, industrial importance, export potential of tropical vegetable crops - Classification of vegetable crops - Effect of climate, soil, water and nutrients on vegetable crop production and their management - Cropping systems - Seed production techniques and constraints in temperate vegetable crops.

Unit II Cruciferous vegetables

Composition and uses - origin and distribution - area and production - climate and soil requirements - season - warm winter types - 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: cabbage, cauliflower, Brussels sprouts, sprouting broccoli and chinese cabbage.

Unit III Potato, peas, beans and chow chow

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 - use of TPS in potato

Crops: potato, peas, beans, and chow chow.

Unit IV Root crops

Crops: carrot, beet root, radish and turnip.

**Unit V Salad vegetables**


Crops: Kale, cress, celery, rhubarb, asparagus, artichoke, leek, lettuce and spinach.

**Practical**

Identification and description of temperate vegetable crops -nursery practices and for transplanted vegetable crops- preparation of field and sowing /planting for direct sown/ transplanted vegetable crops- herbicide use in vegetable culture - top dressing of fertilizers and inter-culture - use of growth regulators - identification of nutrient deficiencies - physiological disorders- maturity indices and harvesting - working out cost of cultivation for temperate vegetable crops - Visit to temperate vegetable farms, research stations, commercial farm.

**Lecture schedule**

1. Area, production, world scenario, industrial importance, export potential of temperate vegetable crops
2. Effect of climate and soil on temperate vegetable crop production and their management
3. Effect of water and nutrients on temperate vegetable crop production and their management
4. Cropping systems
5. Organic farming and GAP in temperate vegetable crops
6. Export standards for temperate vegetable crops
7. Cabbage: Composition and uses - area and production- climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate - nursery practices - containerized transplant production and transplanting - preparation of field - spacing - planting systems - planting - water and weed management
9. Cauliflower: Composition and uses - area and production- climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate - nursery practices - containerized transplant production and transplanting - preparation of field - spacing - planting systems - planting - water and weed management
11. Brussels sprouts - climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate - nursery practices - containerized transplant production and transplanting - preparation of field - spacing - planting systems - planting - water and weed management
13. Sprouting broccoli - composition and uses - area and production - climate and soil requirements - season - warm winter types - 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
14. Chinese cabbage: Composition and uses - area and production - climate and soil requirements - season - warm winter types - 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 system - constraints in production - harvest - yield
15. Potato: Composition and uses - area and production - climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate - nursery practices - containerized transplant production and transplanting - preparation of field - spacing - planting systems - planting - water and weed management
17. Mid semester examination
18. Peas: Composition and uses - area and production - climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate - nursery practices - containerized transplant production and transplanting - preparation of field - spacing - planting systems - planting - water and weed management
20. Beans: Composition and uses - area and production - climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate -
preparation of field - spacing - planting systems - planting - water and weed management


22. Chow chow: Composition and uses - area and production-climate and soil requirements-season-warm winter types-varieties and hybrids - seed rate-preparation of field-spacing-planting systems-planting-water and weed management-nutrient requirement-nutrient deficiencies-physiological disorders-use of chemicals and growth regulators-cropping systems - constraints in production –harvest-yield.


nutrient deficiencies - physiological disorders - use of chemicals and growth regulators - cropping systems - constraints in production - harvest - yield

32. Artichoke and Leek - composition and uses - area and production - climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate - nursery practices - 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

33. Lettuce: composition and uses - area and production - climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate - nursery practices - 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

34. Spinach: composition and uses - area and production - climate and soil requirements - season - warm winter types - varieties and hybrids - seed rate - nursery practices - 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

Practical

1. Nursery preparation and sowing transplanted temperate vegetables
2. Nursery preparation, seed rate, spacing for direct sown temperate vegetables
3. Soil water conservation, contour planting, crop geometry
4. Use of herbicides, preparation of solution, application
5. Water management practices
6. Nutritional requirement, including major and micro nutrients
7. Scheduling of nutrients for temperate vegetables through drip fertigation
8. Use of growth regulators, preparation of solution and application in temperate vegetables
9. Identification of physiological disorders and nutritional disorders
10. Maturity indices and harvesting
11. Protected cultivation of temperate vegetables
12. Organic practices, GAP, precision farming in temperate vegetables
13. Visit to commercial farms in plains
14. Visit to commercial farms in hills
15. Visit to cold storage / markets / processing centres
16. Project preparation and working out economics
17. Practical examinations

Outcome
- To provide in depth knowledge about the latest production technology of temperate vegetable crops
- Knowledge about quality requirement and production techniques for export
- Managing skill for solving field problems

Text books

Further readings
2. Hazra, P. and M. G. Som. 1999. Technology of vegetable production and improvement Naya Prakash, Calcutta

Journals
1. Vegetable sciences
2. Acta Horticulturae
3. Indian Journal of Horticulture
4. Indian Horticulture
5. Progressive Horticulture
6. International Journal of Vegetable Science
7. Scientia Horticulturae

e references
- http://www.sciencedirect.com/science
- http://www.agnet.org/library/eb/476
AGR 211 Weed and Water Management in Horticultural Crops 1 + 1

Theory

Unit I


Unit II

Chemical, weed management - classification herbicide formulations - adjuvants, herbicide protectants and antidotes - Mode and mechanism of action of herbicides - Herbicide selectivity - Principles of herbicide selectivity

Unit III

Herbicide resistant weeds and crops – Principles and concepts - development of transgenic herbicide resistant crops – Success of herbicide resistant crops (HRC) in World and Indian agriculture.

Unit IV


Unit V


Practical

Identification of weeds in wet, garden, dry land and hilly ecosystems - Weed control tools and implements - Characteristics of important herbicides - Herbicide spray equipments- Herbicide application techniques – Spray fluid calibration - Effect of herbicide on soil microflora - Economic evaluation of weed control methods in horticultural crops and cropping systems - Soil moisture content by gravimetric method
and instrumentation technique - field capacity and permanent wilting point - Methods of irrigation - landscaping for different surface irrigation methods - Measurement of irrigation water, evapotranspiration, crop water requirement - irrigation efficiency - Design and layout of micro irrigation systems - Economics of drip and sprinkler irrigation systems - Fertigation schedule for horticultural crops - water quality and drainage

Lecture schedule

1. Weeds - Definitions and characteristics of weeds- weed seed dormancy - weed ecology - dissemination of weeds
2. Classification and characteristics of weeds of different agro ecosystems - lowland weeds, irrigated upland rainfed land weeds and hilly weeds
3. Identification, classification and characteristics of weeds of different agro ecosystems - aquatic and parasitic weeds and non crop situation
5. Principles and methods of weed management- Preventive, cultural, mechanical, chemical, biological and alternate methods
6. IWM in horticultural crops and cropping systems and Non chemical weed management techniques in organic agriculture
7. Mid semester examination
8. Classification and characteristics of herbicides and herbicide formulations - History and development
9. Herbicide use efficiency - Adjuvants, herbicide protectants and antidotes - Herbicide and herbicide mixtures in India
11. Herbicide resistant weeds and their impact on weed management, Development
of transgenic herbicide resistant crops. Success of herbicide resistant crops (HRC) in world and Indian agriculture

12. Water resources of India and Tamil Nadu, Importance of irrigation water, role of water in crop production

13. Soil- water- plant relationship – soil moisture constant – soil water movement

14. Soil moisture extraction pattern – evapotranspiration – water requirement of horticultural crops, critical stages for irrigation

15. Irrigation methods – surface, subsurface and advance methods – drip, sprinkler and green house and landscape irrigations

16. Fertigation - Water use efficiency – Agronomic practices for enhancing WUE

17. Quality of irrigation water - Management of problem waters – Drainage

**Practical schedule**

1. Identification and classification of wet land and garden land weeds
2. Identification and classification of dry land and hilly weeds
3. Practising Skill development on mechanical weed management
4. Identification and classification of herbicides
5. Practising Skill development on herbicide application techniques
6. Practising Skill development on spray equipments and spray fluid calibration
7. Calculation of herbicide quantity and recommendation
8. Economic evaluation of weed control methods in horticultural crops and cropping systems.
9. Estimation of soil moisture content by gravimetric method and instrumentation technique
10. Estimation of field capacity and permanent wilting point
11. Methods of irrigation and acquiring skill in landscaping for different surface irrigation methods.
13. Design and layout of micro irrigation systems for different horticultural crops
14. Working out economics of drip and sprinkler irrigation systems
15. Developing fertigation schedule for horticultural crops
16. Estimation of water quality and drainage
17. Practical Examination

References

2. Jaganathan R., and R. Jayakumar, Weed Management, Kalyani Publisher, New Delhi

Further Readings


SAC 201 Fundamentals of Soil Science 2 + 1

Aim

This course is designed to provide better understanding of soils and their formation. It is aimed to inculcate knowledge among under graduate students regarding physical, chemical and biological properties of soils. Further, to make the students to understand about pedological and edaphological approaches of soil study.

Theory

Unit I

Soil – Pedalogical and edaphological concepts – Origin of the Earth – Composition of Earth’s crust - Rocks and minerals – primary and secondary minerals.

Unit II

Weathering of rocks & minerals - Physical, chemical and biological weathering – Soil formation - factors-active & passive. Soil forming processes - fundamental and specific soil forming processes- Soil profile.

Unit III

Phases of soil. Soil physical properties and their significance – Soil texture and textural classes - Soil structure and classification – Soil consistency

Unit IV

Bulk density, particle density and porosity - Soil colour – significance - causes and measurement. Soil temperature - Soil air - Soil water- Soil water potentials - Soil moisture constants – Movement of soil water – saturated and unsaturated flow – Infiltration, hydraulic conductivity, percolation, permeability and drainage

Unit V

Soil colloids – Properties, types and significance – Layer silicate clays – their genesis and sources of charges – Ion exchange – CEC, AEC and Base saturation – Factors influencing Ion exchange - significance. Soil reaction, Buffering capacity and EC

Unit VI

Practical


Lecture Schedule

1. Soil definition - soil as a three dimensional natural body - pedagogical and edaphological concepts.
2. Origin of earth - theories - planetesimal and nebular hypothesis - Composition of Earth’s crust.
3. Rocks - definition, formation, classification - igneous, sedimentary and metamorphic rocks
4. Brief description of important rocks - mineralogical composition
5. Minerals - definition, occurrence, classification of important soil forming primary minerals - silicate and non-silicate minerals, ferro and non-ferro magnesium minerals
6. Formation of secondary minerals - clay minerals and amorphous minerals
7. Weathering of rocks and minerals - Physical, chemical and biological
8. Soil profile description - master horizons - pedon and poly pedon
9. Factors of soil formation - Active soil forming factors
10. Factors of soil formation - Passive soil forming factors
11. Fundamental soil forming process - eluviation, illuviation and humification.
12. Specific Soil forming processes - podzolization, laterization, salinization, alkalization, calcification, decalcification, pedoturbation.
13. Phases of soils - solid, liquid and gaseous phases - Properties of soil - defining the physical, chemical and biological properties
16. Soil consistence – cohesion, adhesion, plasticity, Atterberg’s constants – upper and lower plastic limits, plasticity number – significance of soil consistence
17. Mid semester examination
18. Soil bulk density, particle density and porosity – factors influencing – significance
19. Soil colour – causes and measurement – Munsell colour chart – factors influencing soil colour – significance
20. Soil temperature – measurement, soil air – composition – aeration, measurement – significance of soil temperature and soil air
21. Soil water – forms of water, measurement, units of expression and pF scale
22. Soil water potentials – gravitational, matric, osmotic – soil moisture constants
23. Movement of soil water under saturated and unsaturated flow – infiltration, hydraulic conductivity, percolation, permeability and drainage
24. Soil colloids – types, properties – inorganic colloids and organic colloids
25. Layer silicate clays – genesis and classification – 1:1, 2:1 expanding and non expanding, 2:2 clay minerals, amorphous minerals
26. Sources of charges in expanding and non expanding crystalline lattice clays, amorphous minerals and organic colloids
27. Ion exchange reactions – cation exchange, anion exchange and base saturation – significance
28. Soil reaction (pH) – definition, pH scale, factors affecting soil pH, buffering capacity – significance
29. Soil Electrical Conductivity – factors affecting EC – significance
30. Soil organic matter – composition, decomposition, mineralization and immobilization
31. Carbon cycle, C : N ratio, biomass carbon and nitrogen
32. Fractions of soil organic matter – humus formation and stabilization
34. Importance of soil properties in crop growth

Practical schedule
1. Identification of common rocks and minerals
2. Soil sample collection
3. Visit to soils of different terrains and study of soil profiles
4. Determination of bulk density, particle density and porosity – cylinder, wax coating and core methods.
5. Soil textural analysis – feel method, International pipette method (part 1)
6. International pipette method (part 2)
7. International pipette method (part 3)
8. Determination of soil colour and temperature.
9. Determination of soil moisture – Gravimetric and gypsum block method
10. Determination of soil moisture – Tensiometer, TDR and neutron probe
11. Determination of Infiltration rate
12. Determination of hydraulic conductivity
13. Determination of soil pH and EC
14. Estimation of soil organic carbon
15. Colloquium 1. – Chemical constituents of soil – water soluble elements, total elemental composition – relevance in soil properties and behaviour
16. Colloquium 2. – Preparation of interpretative reports of soil analysis and assignments
17. Final practical examination

Outcome
This course will give a comprehensive knowledge on rocks and minerals, their composition and the types of soils formed from different parent materials. It will enrich the students on the role of soil forming factors and processes in soil formation. The
students will understand the various soil physical, chemical and biological properties and their impact on plant growth. The knowledge gained in this course will be useful in understanding the behaviour of soils in crop production and to manage.

References


References

- http://www.sciencedirect.com/science?_ob=Article_URL&_udo=B6V67-4C837XP user=2945072&_coverDate=01/31/2005&_rdoc=1&_fmt=high&_orig
- http://www.pedosphere.com/volume01/pdf/Section_01.pdf
- http://waterquality.montana.edu/docs/homeowners/Septic_Drainfield_Soil_Suitability_Presentations/6_Soil_Texture_and_Structure.pdf
- http://www.soils.wisc.edu/courses/SS325/morphology.htm
AEN 201 Fundamentals of Entomology 2 + 1

Theory

Unit I History and importance

Entomology as a science - its importance in Agriculture. History of Entomology in India, Position of insects in the animal kingdom and their relationship with other classes of Arthropoda, Reasons for insect dominance.

Unit II Morphology

General organisation of insect body wall - structure and function, cuticular appendages, moulting. Body regions - insect head, thorax and abdomen, their structures and appendages.

Unit III Anatomy and physiology


Unit IV Taxonomy of apterygota and exopterygota

Taxonomy, Classification and nomenclature of insects. Distinguishing characters of agriculturally important orders and families of Apterygotes- Collembola and Thysanura, Exopterygotes - Ephemeroptera, Odonata, Orthoptera, Phasmida, Dictyoptera, Embioptera, Dermaptera, Hemiptera, Isoptera, Psocoptera, Mallophaga, Siphunculata and Thysanoptera.

Unit V Taxonomy of endopterygota

Distinguishing characters of agriculturally important families of Lepidoptera, Coleoptera, Diptera, Hymenoptera, Siphonaptera, Strepsiptera and Neuroptera.

Practical

reproductive systems of grasshopper / coackroach – Observing the characters of agriculturally important orders and families.

Lecture schedule

1. Study of insects and their importance in Agriculture. History of Entomology in India - Position of insects in the animal kingdom - relationship with other members of Arthropoda.
2. Insect dominance - structural, morphological and physiological factors responsible for dominance.
3. Insect body wall - its structure and function cuticular appendages.
5. Structure of insect head and its appendages.
7. Structure of insect abdomen and its appendages.
15. Types of reproduction - oviparous, viviparous, paedogenesis, polyembryony
ovoviporous and parthenogenesis.


17. Mid-semester examination

18. Structure of sense organs - types of sensilla - photoreceptors; chemoreceptors and mechanoreceptors

19. Exocrine and endocrine glands and their function - effect on metamorphosis and reproduction

20. Tropism and Biocommunication in insects – Sound and light production.


22. Distinguishing characters of insect orders – Apterygota (Collembola and Thysanura)

23. Exopterygota – (Ephemeroptera, Odonata and Phasmida)

24. Dictyoptera, Dermaptera, Embioptera

25. Orthoptera (Families of Agricultural Importance) and Isoptera – social life in termites

26. Hemiptera (Families of Agricultural Importance) and Thysanoptera.

27. Pscoptera, Mallophaga and Siphunculata.

28. Endopterygota – Lepidoptera and families of agricultural importance.

29. Lepidoptera and families of agricultural importance.

30. Coleoptera and families of agricultural importance.

31. Coleoptera and families of agricultural importance.

32. Diptera and families of agricultural importance.

33. Hymenoptera and families of agricultural importance.

34. Neuroptera (Families of Agricultural Importance), Strepsiptera and Siphonaptera.

Assignment
Each student has to submit a minimum of 100 preserved insects representing various orders and families.

Practical schedule

1. Observations on external features of grasshopper / cockroach
2. Methods of insect collection, preservation, pinning, labelling, display and storage
3. Types of insect head and antenna
4. Mouth parts of cockroach, modifications in the mouth parts in plant bug, female mosquito, honeybee, thrips, antlion grub, housefly, moths and butterflies
5. Structure of thorax and abdomen and their appendages — modifications in insect legs and wings — wing venation, regions and angles — wing coupling.
6. Types of immature stages of insects.
7. Study of digestive system.
8. Study of male and female reproductive systems.
9. Observing the characters of Apterygota - Collembola and Thysanura and Exopterygota - Odonata and Ephemeroptera and Phasmida
10. Dictyoptera, Dermaptera, Embioptera, Orthoptera (Acrididae, Tettigonidae, Gryllidae and Gryllotalpidae), Mallophaga and Siphunculata
11. Exopterygota — Isoptera and Hemiptera — Homoptera (Cicadidae, Cicadellidae, Delphacidae, Aphididae, Cercopidae, Membracidae, Aleyrodididae, Coccidae, Diaspididae, Pseudococcidae, Kerridae and Psyllidae); Heteroptera (Reduviidae, Pentatomidae, Miridae, Coreidae, Pyrrhocoridae, Lygaeidae, Nepidae, Belastomatidae, Gerridae, Cimicidae, Tingidae),
12. Observing the characters of orders Thysanoptera and Diptera (Cecidomyiidae, Agromyzidae, Tephritidae, Asilidae, Tabanidae, Tachinidae, Hippoboscidae, Culicidae, Syrphidae and Muscidae)
13. Observing the characters of Hymenoptera (Tenthredinidae, Apidae, Sphecidae Vespidae, Formicidae, Xylocopidae, Chalcididae Megachilidae Ichneumonidae, Bethylidae, Braconidae, Agaonidae, Evaniidae, Encyrtidae,
Eulophidae and Trichogrammitidae).


15. Observing the characters of Lepidoptera (Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Satyriidae, Crambidae, Pyraustidae, Noctuidae, Arctiidae, Bombycidae, Cochliidiidae, Geometridae, Gelechiidae, Pterophoridae, Saturniidae, Sphinxidae, Lymantriidae and Hesperidae)

16. Observing the characters of Neuroptera (Chrysopidae, Myrmeliontidae, Mantispidae, Ascalaphidae), Siphonoptera. Identification and naming of collected insects based on characters — order and family

17. Practical examination

Text books


Further reading


e references

- http://www.itis.usda.gov/itis/
- http://www.cabi-publishing.org
Theory

Unit I Introduction

Seed - definition – importance – quality characteristics – history of seed industry - classes of seed - generation system - multiplication ratio - seed replacement rate - varietal deterioration - causes – maintenance.

Unit II Principles of seed production


Unit III Seed quality control – seed certification


Unit IV Seed testing


Unit V Seed legislation

Practical

Seed structure - Calculation of SMR and SRR - varietal and hybrid seed production plots - pre sowing seed management techniques - (dormancy, priming, coating and pelleting) - identification of contaminants and practicing roguing - studies on physiological and harvestable maturity and seed extraction - practicing field counting - visit to seed processing unit - visit to Directorate of Seed Certification- - visit to grow out test plots - seed sampling, mixing and dividing - analysis of physical purity - moisture estimation - conducting germination tests - seed health test and seedling evaluation - quick viability test - visit to seed retail shop for observing the method of taking official sample.

Lecture schedule

1. Seed - definition – importance – quality characteristics - history of seed industry
2. Classes of seed - generation system - multiplication ratio- seed replacement rate
3. Varietal deterioration - causes – maintenance
4. Methods and tools of seed production in variety and hybrid
5. Seed crop management- land requirement- isolation – pre-sowing seed treatment –dormancy
7. Physiological maturation – pre-harvest sanitation spray - harvest and post harvest techniques-extraction- methods – drying
8. Processing - seed treatment-pre-storage – packing –storage –mid storage treatment
9. Mid semester examination
10. Seed certification -phases – procedures- general and specific standards
11. Field inspection – field counts –contaminants --- post harvest inspection
13. Seed testing - importance – seed lot – seed sample - sampling methods – purity analysis – moisture estimation
14. Germination tests - viability test – seed vigour tests - seed health test
15. Seed Act and Rules – Central Seed Committee - Central Seed Certification Board, State Seed Certification Agency - Central and State Seed Testing Laboratories
16. Seed Inspector - duties and responsibilities - offences and penalties - Seed Control Order 1983
17. New policy on seed development / New Seed Policy 1988– National Seed Policy 2002 - Seed Bill 2004

Practical Schedule

1. Seed structure in horticultural crops
2. SMR and SRR - calculation - factors influencing – variety / hybrid - comparison
3. Practicing varietal and hybrid seed production plots and pre sowing seed management techniques (dormancy)
4. Practising pre sowing seed management techniques (priming, coating and pelleting)
5. Identification of contaminants and practising roguing
6. Studies on physiological and harvestable maturity and seed extraction
7. Practicing field counting
8. Visit to seed processing unit
9. Visit to Directorate of Seed Certification
10. Visit to grow out test plots
11. Seed sampling, mixing and dividing
12. Analysis of physical purity and estimation of seed moisture
13. Conducting germination tests
14. Seedling evaluation and seed health test
15. Practising quick viability test
16. Visit to seed retail shop for observing the methods of taking official sample
17. Final examination

Text book


Further reading


Reference

- www.dare.gov.in
- http:sfci.nic.in
- www.iar.org.in/Directorate1.htm
- www.apsa.org
- www.seedassociationofindia.com
- www.apaseed.com
- www.apaseed.org

Journals

- Asian seed and planting material
- Seed Research
- Journal of Asian Horticulture
- Indian Horticulture
- Agriculture and industry survey
- Seed Science and Technology
- Journal of Seed Science Research
PAT 201 Fundamentals of Plant Pathology 2 + 1

Theory

Unit I  Plant pathogenic organisms

Plant Pathology : definition, history – Pathogens : fungi, bacteria, virus, viroid, phytoplasma, Fastidious vascular bacteria, spiroplasma , algae and phanerogamic parasites – Koch's postulates - Types of parasitism - General characters of fungi -- Major symptoms of fungal diseases

Unit II Fungal taxonomy based on molecular phylogeny

Classification of Kingdom – Protozoa - important taxonomic characters and symptoms and life cycle of Plasmodiophora brassicae -Classification of Kingdom – Chromista- General characters - Classification of Oomycetes .Symptoms and life cycle of Pythium,Phytophthora and Albugo peronosclerospora, Sclerospora. Perenospora, Pseudoperenospora and Plasmapora-Classification of Kingdom– Chytridiomycota and Zygomycota - important characters, symptoms and life cycles of Rhizopus - Classification of Kingdom– Ascomycota- important characters

Symptoms and life cycles of Erysiphe, Leveillula, Phyllactinia, Uncinula and Podosphaera pyricularia , Helminthosporium, Alternaria, Cercospora and Curvularia, Fusarium, Verticillium, Colletotrichum, Gloeosporium, Pestalotia, Macrophomina and Botryodiplodia,-Classification of Kingdom - Basidiomycota - important characters

Symptoms and life cycles of Puccinia ,Uromyces, Ustilago and Hemileia, Ganoderma, Agaricus, Pleurotus , Volvariella and Calocybe

Symptoms and important characters of Corticium, Rhizoctonia and Sclerotium

Unit III Bacteria, phytoplasma, virus and algal parasites

Classification, general characteristics and symptoms of bacterial diseases, mode of entry and spread - General characteristics and symptoms of viral, viroid and phytoplasma diseases - General characters of algal parasite Cephaeleuros and phanerogamic parasites.

Unit IV Epidemiology and plant disease management

Unit V Biological control and biotechnological approaches

Biological control of crop diseases and their scope – biocontrol agents – Fungi, bacteria, – use of plant products and anti viral principles in plant disease management. Biotechnological approaches in plant disease management

Practical

General characters of fungi – mycelium – spores – asexual, sexual and vegetative spores- sexual and asexual fruiting body in fungi. Study of symptoms, host parasite relationship and systematic position of pathogens causing the following diseases.

Club root, powdery scab, damping off, foot rot, late blight, bud rot, white blisters, downy mildew, fruit rot, leaf curl,bird’s eye spot, scab, sooty mould, sigatoka disease, powdery mildew, rusts, basal stem rot, blister blight, leaf spot, leaf blight, anthracnose, wilt, dry root rot and wet root rot. Bacterial diseases – symptoms - leaf spot, blight, ring rot, head rot, canker, scab, crown gall, wilt and soft rot. Symptoms and vectors of virus and phytoplasma diseases. Algal diseases - phanerogamic parasites. Deficiency diseases.

Various groups of fungicides and antibiotics - Preparation of Bordeaux mixture and Bordeaux paste – Preparation of fungicidal spray solution – Delivery of fungicides, Production of immunized seedlings in citrus – Biological control agents and their mass production – Trichoderma and Pseudomonas - Methods of application of biocontrol agents – Preparation of botanicals – leaf extracts, oil emulsions and anti viral principles
Lecture schedule

1. Definition and history of Plant Pathology
3. General characters of fungi - mycelium - asexual, sexual and vegetative spores - asexual and sexual fruiting bodies.
4. Classification of Kingdom - Protozoa - important taxonomic characters and symptoms and life cycle of Plasmodiophora brassicae
5. Classification of Kingdom - Chromista- General characters - Classification of Oomycetes. Symptoms and life cycle of Pythium, Phytophthora and Albugo
6. Symptoms and life cycle of Peronosclerospora, Sclerospora, Penespora, Pseudoperenospora and Plasmopora
7. Classification of Kingdom- Chytridiomycota and Zygomycota - important characters, symptoms and life cycles of Rhizopus
8. Classification of Kingdom- Ascomycota- important characters
9. Symptoms and life cycles of Erysiphe, Leveillula and Phyllactinia,
10. Symptoms and important characters of Pyricularia, Helminthosporium, Alternaria, Cercospora and Curvularia, Fusarium, Verticillium
11. Symptoms and important characters of Colletotrichum, Gloeosporium, Pestalotia, Macrophomina, and Botryodiplodia,
12. Classification of Kingdom - Basidiomycota- important characters
13. Symptoms and life cycles of Puccinia, Uromyces, Ustilago and Hemileia
15. Symptoms and important characters of Corticium, Rhizoctonia and Sclerotium
16. Plant pathogenic bacteria, general characters - Symptoms of bacterial diseases - leaf spot, streak, blight, canker, scab, wilt, crown gall, ring rot, head rot and soft rot.

17. Mid semester examination

18. General characters of virus - Common symptoms of virus and viroid diseases - Chlorosis, mosaic, stripe, vein clearing, vein banding, crinkle, enation, necrosis, dwarfing, rosette, bunchy top, bract mosaic and twisting, cadang cadang of coconut and potato spindle tuber

19. General characters - Symptoms of phytoplasma diseases - phyllody, witches broom, little leaf, dwarf, yellows and sandal spike and algal parasite – *Cephaleuros*

20. Phanerogamic parasites – *Cuscuta, Orobanche, Loranthus* and *Striga*

21. Epidemiology of crop diseases - weather factors and their role in disease development – temperature, rainfall, relative humidity, dew and inoculum potential.

22. Survival and spread of fungal bacterial and viral pathogen

23. Disease surveillance, assessment and forecasting.


25. Eradication – physical, chemical and cultural methods.


27. Fungicides - formulations and adjuvants - characteristics of an ideal fungicide

28. Fungicides – definition, protectant, eradicant, therapeutant, fungistat. Groups of fungicides – copper fungicide and sulphur fungicide,

29. Heterocyclic nitrogen compound, quinones, and miscellaneous fungicides.

30. Systemic fungicides and antibiotics

31. Methods of application of fungicides – seed treatment, dry and wet, soil drenching, foliar spray, post harvest treatment, corm injection, root feeding, capsule application and acid delinting and precautions while handling fungicides.


34. Biotechnological approaches of crop disease management such as meristem tip culture and somaclonal variation.

Practical schedule

1. General characters of fungi – types of mycelium, asexual, sexual and vegetative spores – types of sexual and asexual fruiting bodies.

2. Study of symptoms, fungal characters and host parasite relationships of Plasmodiophora brassicae (club root), Pythium (damping off), Phytophthora (late blight)

3. Study of symptoms, fungal characters and host parasite relationships of Plasmopara, Peronospora, Pseudoperonospora and Rhizopus (Jack fruit rot)

4. Study of symptoms, fungal characters and host parasite relationships of Taphrina (leaf curl), Protomyces (stem gall), Capnodium (sooty mould), venturia (scab) and Mycospherella (leaf spot)

5. Study of symptoms, fungal characters and host parasite relationships of Erysiphe, Podosphaeria, Sphaeretheca, Leveillula (powdery mildew), Puccinia, Uromyces, hemileia (rust) and Ganoderma (basal stem rot)

6. Study of symptoms, fungal characters and host parasite relationships of Helminthosporium, Cercospora (leaf spot), Alternaria ((leaf blight), Colletotrichum (anthracnose) and Gloeosporium (fruit rot)

7. Symptoms of bacterial diseases – leaf spot, blight, canker, scab, crown gall, wilt and soft rot.

8. Symptoms and vectors of viral diseases – chlorosis, mosaic, vein clearing, vein banding, leaf crinkle and leaf curl, enation, necrosis, dwarfing, rosette, bunchy top and bract mosaic.
9. Symptoms of phytoplasma (little leaf and phyllody) algal diseases – *Cephaleuros* and phanerogamic parasites

10. Study of various groups of fungicides.

11. Preparation of Bordeaux mixture and Bordeaux paste.


14. Biocontrol agents – mass production of *Trichoderma viride* and *Pseudomonas fluorescens*.

15. Preparation of leaf extracts, oil emulsion of neem and other botanicals and antiviral principles.

16. Survey and assessment of foliar crop diseases, post harvest diseases, soil borne and viral diseases

17. Practical examination

**Text books**

References

- www.mycobank.org
- www.mycology.net
- www.bspp.org.uk
- www.ictv.org
- http://edis.ifas.ufl.edu
- http://plant_disease.ippc.orst.edu
- http://korban.nres.vivc.edu
AMP 201 Livestock and Poultry Production Management 2 + 1

Theory

Unit I Introduction to livestock management


Unit II Dairy cattle management


Unit III Sheep and Goat management


Unit IV Management of swine

Classification of breeds – Economic traits - housing - nutrition – creep feeding - care and management of adult and young stock - common disease- prevention and control.
Unit V Poultry management


Practical

Study of external parts of livestock - Identification of livestock and poultry- Tattooing-ear tags-wing and leg bands-Common restraining methods-Disbudding (or) dehorning-Different methods of castration- dentition-Study of type design of animal and poultry houses-Selection of dairy cow and work bullock-Determination of specific gravity, fat percentage and total solids of milk- Common adulterants and preservatives of milk- Demonstration of cream separation, butter, ice cream and ghee making- Identification of feeds and fodder- Economics of dairy, goat and swine farming - Study of external parts of fowl - Preparation of brooder house - brooder management- Identification of layer and non layer-debeaking, delousing and deworming of poultry-vaccination schedule for broiler and layer-dressing of broiler chicken - Economics of broiler and layer farming - Visit to a modern dairy plant and commercial layer and broiler farms - Demonstration of incubator and setter.

Lecture schedule

1. Prelusion-significance of livestock and poultry in Indian economy-livestock and poultry census. Different livestock development programmes of Government of India
3. Definition of breed-classification of indigenous white and black cattle-breed characteristics of Sindhi, Kangayam and Umblacherry.
4. Breed-characteristics of exotic cattle -Jersey and Holstein Friesian – Indian Buffaloes- Murrah and Surti.
5. Breeding-cross breeding-upgrading-economic traits of cattle
6. Estrous cycle – signs of estrous - artificial insemination-merits and demerits-Principles and outline of embryo transfer
7. Housing management-farm site selection and floor space requirement for calves, heifer, milch animal and work bullocks.
8. Systems of housing-single row system-double row system- head to head and tail to tail-merits and demerits - Type design of house.
9. Care and management of new born calf and heifers
10. Care and management of pregnant animal and lactating animals.
11. Care and management of dry cows and work bullock.
15. Diseases-classification-viral, bacterial and metabolic-general control and preventive measures.
16. Viral diseases-foot and mouth andr. bacterial diseases, anthrax, hemorrhagic septicemia- black quarter - metabolic- tympanites, acidosis, ketosis and milk fever.
17. Mid semester examination.
19. Systems of rearing-housing management - type design- floor diagram-space requirement for adult and young stock.
20. Care and management of ram, ewe and lamb-nutrition- feeds and fodder for small ruminants.
21. Care and management of buck, doe and kid- nutrition- flushing.
22. Common ailments of sheep and goat-sheep pox-foot and mouth-blue tongue-enterotoxaemia -Ecto and endo parasites.
24. Care and management of sow, boar and piglets- nutrition- creep feeding.
25. Disease prevention and control of swine diseases – hog cholera, foot and mouth, ecto and endo parasites.
26. Interrelationship between poultry husbandry and agriculture-classification of breeds *viz.* layer, broiler and dual purpose-nomenclature of commercial strains of layer and broiler.
27. Care and management of new arrivals-brooder management.
28. Systems of housing- deep litter and cage system- floor space requirement-common litter material-litter management-merits and demerits.
29. Care and management of layers- vaccination schedule, preservation of eggs
30. Care and management of broilers-vaccination schedule.
31. Incubation and hatching of eggs.
32. Nutrition-feed formulation-composition of chick, grower, layer broiler starter and Finisher mashes-Feed Conversion Ratio / dozen egg or kg of meat production.
34. Bacterial disease- E.coli- coryza-salmonellosis-protozoan- coccidiosis-casuvative organism, symptoms and preventive measures.

**Practical schedule**

1. Study of external parts of livestock
2. Identification of livestock and poultry
3. Common restraining methods of livestock
4. Disbudding, dehorning, castration and dentition of livestock
5. Study of type design of animal and poultry houses
6. Selection of dairy cow and work bullock
7. Determination of specific gravity, fat percentage and total solids of milk.

   Common adulterants and preservatives of milk
8. Demonstration of cream separation, butter, ice cream and ghee making
9. Identification of feeds and fodder
10. Economics dairy, goat and swine farming
11. Study of external parts of fowl. Preparation of brooder house
12. Identification of layer and non layer
13. Debeaking, delousing and deworming of poultry-vaccination schedule for broiler and layer
14. Demonstration of dressing of broiler chicken. Economics of broiler and layer farming
15. Visit to a modern dairy plant and commercial layer and broiler farms
17. Final practical examination

Text books
2. Dairy India Year Book 2007. A-25, Priyadarshini Vihar, Delhi
7. Prabakaran, R., 1998. Commercial Chicken Production. Publisher P.Saranya, 5/2, Ramalingam Street, Seven Wells, Chennai

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www.sciencecentral.com
www.ansci.umn.edu/poultry/resources/layermgmt.htm
www.armsd.com/
www.animalwebsites.co.uk
www.intervet.com/species/pigs/websites.aspx
www.britishangoragoats.org.uk/management.htm
www.indiagoatfarm.com
www.indiadairy.com
www.indiagronet.com
www.foodsci.uoguelph.ca
www.fil-idf.org
FMP 211 Farm Power and Machinery 1 + 1

Aim
To equip the students with sufficient theoretical knowledge and practical skills about tractor power and implement resources used in agriculture

Theory
Unit I Farm power
Farm power in India- sources, IC engines- working principles, two stroke and four stroke engines, IC engine terminology, different systems of IC engine. Tractors-types, selection of tractors and cost of tractor power - Tractor and implement selection for different agricultural operations

Unit II – Tillage, sowing and planting machinery
Tillage implements- primary and secondary tillage implements - Sowing methods - seed drills, seed cum fertilizer drills - implements for intercultural operations - wet land equipment - Paddy transplanters - field and nursery requirements

Unit III – Plant protection and harvesting machinery
Plant protection equipment - Harvesting tools and equipment- reapers and combine - Harvesting machinery for groundnut, tuber crops – Sugarcane harvesters - Equipment for land development and soil conservation -Tools for horticultural crops

Practical
Study of different components of IC engine, four stroke petrol engine, two stroke petrol engine. Study of MB plough, disc plough, seed-cum-fertilizer drills, their mechanisms. Operation of tractor and implements - operation and maintenance of power tiller - Study of different inter-cultivation equipments - Sprayers and dusters - their operation, repairs and adjustment - Harvester for paddy, sugarcane and horticultural crops – Field capacity and cost analysis
Lecture schedule

1. Farm power in India - human, animal, mechanical and electrical energy sources and their use in agriculture
2. Two stroke and four stroke engines, working principles, applications - types, power and efficiency
3. Different systems of IC engine – cooling, lubricating, fuel injection systems
4. Tractors- types and utilities
5. Tillage, objectives, types - ploughing methods. Field capacity and field efficiency.
6. Primary tillage, objectives, mould board ,disc plough, chisel plough and subsoiler, components and functions, types, advantages and disadvantages.
8. Sowing methods - seed drills, seed cum fertilizer drills - components and functions
9. Mid semester examination
10. Paddy transplanters, types, working principle, field and nursery requirements
11. Implements for intercultural operations – cultivators, sweep, junior hoe, manual weeders and power operated weeders for wet and garden land
12. Sprayers and their functions, classification, manually operated sprayers, power sprayers - Dusters, types and uses
13. Harvesting tools and equipments- sickles, paddy reapers and combine - Harvesting machinery for groundnut, tuber crops – Sugarcane harvesters
14. Tools for horticultural crops – propagation tools, planters and harvesting tools and machinery
15. Equipment for land development and soil conservation - dozers, levelers, chisel plough, sub soil plough, blade harrow, bund former
16. Cost of operation of farm machinery – problem solving
17. Tractor and implement selection for different agricultural operations

Practical schedule

1. Study of working of two and four stroke petrol IC engine
2. Study of MB plough and disc plough, measurement of plough size, different parts, horizontal and vertical suction,
3. Study of disc harrows, bund former, leveller and rotavator
4. Study of seed-cum-fertiliser drills- furrow opener, metering mechanism and calibration
5. Study of tractors – their operation and maintenance
6. Learning to drive tractor
7. Learning to operate tractor with mounted implement
8. Study of power tillers - their operation and maintenance
9. Study of different inter-cultivation equipments in terms of efficiency, field capacity
10. Study of plant protection equipments – power sprayers, knapsack sprayers, dusters – minor repairs and adjustment of sprayers
11. Study of paddy transplanters – allied machinery for raising mat nursery
12. Study of paddy reaper and paddy combine – registration and alignment of cutter bars
13. Study of sugarcane, turmeric and groundnut harvesters.
14. Tools for horticultural crops – propagation tools, planters and harvesting tools and machinery
15. Study of land development and soil conservation machinery - dozers, levelers, chisel plough, blade harrow, bund former and trenchers
16. Problems on field capacity and cost of operation of farm machinery
17. Final practical examination

Outcome

Students will be equipped with sufficient theoretical knowledge and practical skills on the availability and handling of tractors, power tillers and various implements used in land preparation, sowing, inter cultivation, plant protection and harvesting operations

Text books

Reference
1. Nakra C.P 1970. Farm Machinery and equipment,: Dhanpat Rai & Son

E references
- www.agricoop.nic.in/dacdivision/Machinery1/directory.htm
- www.farmmachineryshow.org

AGM 202 Applied Microbiology 1 + 1

Aim

This course is designed to give students an understanding of the role of microorganisms in industrial processes pertaining to microbial products. The course encompasses the use of microorganisms in the manufacture of industrial products like enzymes, organic acids, vitamins, alcoholic beverages, microbial production of therapeutic agents, microbial fuels, fermented foods and the like.

Theory

Unit I Industrial processes and Microbial whole cell products- an overview

Introduction to industrial processes for microbial products - Development and range of fermentation processes - component parts of a process; commercially important fermentations - organisms - strain improvement, process, applications; Microbial biomass production - Baker’s yeast; SCP.

Unit II Alcoholic and acid fermentation products

Alcohol fermentations - Microbial production processes for beer, wine, ethanol; Production of organic acid - citric acid, acetic acid, lactic acid.

Unit III Microbial enzymes and other products
Commercial microbial enzymes – amylase, protease, cellulase - production processes and their application; Immobilization techniques; Amino acid - glutamic acid, lysine; Vitamins – B2 and B12.

**Unit IV Secondary metabolites and other products**

Antibiotics- penicillin, streptomycin; Microbial production of solvents; microbial fuels – methane, hydrogen, ethanol and algal biodiesel; Biopolymers: bioplastics, xanthan and dextran; microbial pigments.

**Unit V Fermented foods**

Microbiological production of fermented foods – bread; traditional fermented food products; Fermented dairy products - cheese, yogurt, kefir and other fermented foods - sauerkraut, pickles, green olives and sausages, tea; probiotics; Good manufacturing practices – containment of contaminants in industries – standard tests for assessment of microbial quality.

**Practical**

Isolation of industrially important microorganisms; production of wine; microbial enzyme production – solid state fermentation – organic acid production; isolation and screening of microorganisms producing antibiotics; experimental set up for demonstration of methane and hydrogen production; microbial colourants production; production of fermented dairy and vegetable products; probiotic formulations; standard tests for assessing microbial quality in industrial products.

**Lecture schedule**

1. History, scope and microbes used in industry.
2. Development and range of fermentation processes - component parts of fermentation process
4. Media; Basic functions of a fermentor and component parts
5. Fermentation technology- batch-fed batch and continuous fermentation
6. Process control and downstream processing
7. Whole cell products: Microbial biomass production – Baker’s yeast; SCP
8. Alcoholic beverages- beer, wine and industrial production of ethyl alcohol
9. Mid semester examination
10. Organic acids: lactic acid - citric acid - vinegar - production and uses; Microbial production of solvents.
12. Amino acid - glutamic acid and lysine - production and application; Vitamin - B12 - production and application.
13. Antibiotics - penicillin-streptomycin- production- modifications-assay
14. Microbial fuels – methane, hydrogen, ethanol and algal biodiesel; Biopolymers - Microbial pigments.
15. Microbiological production of fermented foods – traditional fermented food products - probiotics.

**Practical schedule**

1. Isolation of industrially important microbes – yeast/ actinomycetes.
2. Fermentor – components and functions.
3. Primary metabolite: Alcohol fermentation.
5. Production and assay of amylase.
7. Extraction and down streaming.
8. Microbial production of GA3.
9. Microbial production of food colourants.
10. Production of Single Cell Protein.
11. Dairy fermentation: Cheese making.
13. Soy sauce fermentation.
15. Detection of food-borne pathogens (*Salmonella, E.coli*).
16. Industrial visit.
17. Practical examination.
Outcome

At the end of the course, the learner is expected to be able to:

1. Identify the main features that confer a microorganism the potential interest to industry.
2. Determine the system for the production of a particular product. Design strategies to optimize an industrial process.
3. Integrating the knowledge achieved by proposing procedures to hypothetical industries, to produce a metabolite, with features you need.
4. Understand the concepts of probiotics and the good bacteria involved in the production of fermented beverages and foods.

Further reading


e reference

➢  http://microbewiki.kenyon.edu/index/php/microbewiki

II Year IV Semester

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FSC 201 Production Technology of Sub Tropical and Temperate Fruit Crops 2 + 1

Aim

❖ To impart knowledge about the cultivation aspects of sub tropical and temperate fruit crops

Theory

Unit I

Subtropical, temperate and humid zones of India and Tamil Nadu – Classification of subtropical and temperate fruits – Area, production, scope and importance, role on national economy of temperate and subtropical fruit crops.

Unit II

Composition and uses – origin and distribution – species and cultivars, soil and climatic requirements - propagation - main field preparation – spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning – flowering, pollination and fruit set - use of plant growth regulators – Physiological disorders and remedies - maturity indices and harvest – post harvest handling - ripening and storage - production constraints of hill banana, mandarin, grapefruit, pummelo, grapes and avocado.

Unit III

Composition and uses – origin and distribution – species and cultivars, soil and climatic requirements - propagation - main field preparation – spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning – flowering, pollination and fruit set - use of plant growth regulators – Physiological disorders and remedies - maturity indices and harvest – post harvest handling - ripening and storage - production constraints of pine apple, mangosteen, litchi, loquat, rambutan, carambola, durian, passion fruit and rose apple.
Unit IV

Composition and uses – origin and distribution – species and cultivars. soil and climatic requirements - propagation - main field preparation – spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning – problems in flowering, pollination and fruit set – planting of pollinizers - use of plant growth regulators - Physiological disorders and remedies - maturity indices and harvest - post harvest handling and storage - production constraints of apple, pear, peach, plum, strawberry, sweet and sour cherry, black and raspberry, currants, apricot, kiwi, persimmon.

Unit V

Composition and uses – origin and distribution – species and cultivars. soil and climatic requirements - propagation - main field preparation – spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning – flowering, pollination and fruit set – planting of pollinizers - use of plant growth regulators - Physiological disorders and remedies - maturity indices and harvest - post harvest handling and storage - production constraints of pistachio nut, macadamia nut, almond, walnut, pecan nut, chest nut and hazel nut.

Practical

Description and identification of important varieties of sub tropical and temperate fruits – selection, pre-treatment and intercultural operations in hill banana – systems of training, pruning, propagation methods, use of growth regulators in grapes - physiological disorders and remedies in major fruit crops - Study of varieties – propagation methods in mangosteen, loquat, carambola, pine apple - planting systems and growth regulation in pine apple – Description of varieties, propagation and growth regulation in apple, pear, plum and peach – Identification and description of temperate nut crops – study of maturity indices in major sub tropical and temperate fruit crops – visit to sub tropical and temperate zones and study of sub tropical and temperate fruit crops
Lecture schedule

1. Temperate, Subtropical and humid zones of India and Tamil Nadu – Classification of temperate and subtropical fruits.

2. Area, production, scope and importance, role on national economy of subtropical and temperate fruits.

3. Hill Banana - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management, training and pruning - use of plant growth regulators - physiological disorders and remedies - maturity indices and harvest – post harvest handling - ripening and storage

4. Mandarin - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators, physiological disorders and remedies - maturity indices and harvest – post harvest handling - ripening and storage - production constrains

5. Grape fruit and Pummelo - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators, physiological disorders and remedies - maturity indices and harvest – post harvest handling - ripening and storage of - production constrains

6. Grapes - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators
7. Grapes - physiological disorders and remedies - maturity indices and harvest - post harvest handling - ripening and storage - production constraints

8. Avocado - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators, physiological disorders and remedies - maturity indices and harvest - post harvest handling - ripening and storage, production constraints

9. Pineapple - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators, physiological disorders and remedies - maturity indices and harvest - post harvest handling - ripening and storage.

10. Litchi - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators, physiological disorders and remedies - maturity indices and harvest - post harvest handling - ripening and storage.

11. Mangosteen and loquat - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators, physiological disorders and remedies - maturity indices and harvest - post harvest handling - ripening and storage.

13. Durian and Rose apple - Composition and uses – origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators, physiological disorders and remedies - maturity indices and harvest – post harvest handling - ripening and storage - production constraints

14. Passion fruit - Composition and uses – origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of plant growth regulators, physiological disorders and remedies - maturity indices and harvest – post harvest handling - ripening and storage - production constrains

15. Introduction to temperate fruit crops – climatic requirements and growth physiology

16. Bearing habits and training systems of temperate fruit crops

17. Apple - Composition and uses – origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - problems in flowering, pollination and fruit set – planting pollinizers
18. Apple - use of plant growth regulators, physiological disorders and remedies maturity indices and harvest - post harvest handling and storage.
19. Mid semester examination.
23. Strawberry - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning – flowering, pollination and fruit set use of growth regulators, maturity indices and harvest - post harvest handling and storage
24. Cherries - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set use of growth regulators, maturity indices and harvest - post harvest handling and storage

25. Raspberry, Black Berry and Currants - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set use of growth regulators, maturity indices and harvest - post harvest handling and storage

26. Apricot - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage

27. Kiwi - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage

28. Persimmon - Composition and uses – origin and distribution – species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage
29. Pistachio nut - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage

30. Macadamia nut - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage

31. Almond - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage

32. Walnut - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage

33. Pecan Nut - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage
34. Chestnut and hazel Nut - Composition and uses - origin and distribution - species and cultivars soil and climate requirements - propagation - main field preparation - spacing, planting density and cropping systems. Planting and after care - nutrients, water and weed management - training and pruning - flowering, pollination and fruit set - use of growth regulators, maturity indices and harvest - post harvest handling and storage - production constraints of nuts.

**Practical schedule**

1. Hill banana - description, pre treatment of suckers - intercultural operations viz., de suckering and clump management
2. Description of mandarin, pummelo and grape fruit, budding and training practices
3. Visit to sub-tropical fruit zones and identification of sub-tropical varieties
4. Grape varieties, propagation methods and use of growth regulators
5. Training and pruning practices in grapes
6. Identification of physiological disorders and remedies in grapes, mandarin, pummelo and grape fruit
7. Identification and description of varieties of avocado, litchi and passion fruit
8. Study of varieties, propagation, propagation, planting systems and growth regulation in pine apple
9. Description of varieties and propagation methods of mangosteen, loquat and carambola
10. Visit to temperate orchards and identification of temperate fruit varieties
11. Description of apple and pear varieties
12. Study of propagation and growth regulation of apple and pear
13. Description of plum and peach varieties
14. Study of propagation and growth regulation of plum and peach
15. Identification and description of temperate nut crops
16. Study of maturity indices in major sub tropical and temperate fruit crops
17. Practical Examination
Text Books


Further reading


e references

- www.fruits-mg.com
- www.fruits.com
- www.hort.purdue.edu/newcrop/morton
- www.bouquetoffruits.com
- http://www.ishs.org
Journals

- Punjab Hort. J.
- Acta Hort.
- South Indian Horticulture
PSM 201 Production Technology of Spices and Plantation Crops 2 + 1

Theory

Unit I Spices I
Scope and Importance - History - Indian and world scenario - Classification - Institutions involved in research and development - Export potential.

Crops: Black pepper, Cardamom, Turmeric, Ginger, Coriander, Fenugreek and Fennel,


Unit II Spices II

Crops: Clove, Nutmeg, Cinnamon and Tamarind

Origin and distribution - Area and production - Composition and uses - Soil and climate - varieties - propagation - planting - irrigation - nutrition management - weed control - mulching - mixed cropping, intercropping, multi-tier cropping - cover cropping - training and pruning practices - role of growth regulators - harvest and yield - GAP - Organic production of Tree Spices - post harvest technologies - processing - storage - value added products - organic production - constraints

Unit III Plantation crops I

Crops: Coffee, Tea, Rubber, Cashew

- harvest and yield -GAP-Organic production -post harvest handling, processing - value addition and by-products utilization - packaging and marketing and constraints.

**Unit IV Plantation crops II**

Crops: Coconut, Arecanut, Oil palm, Cocoa and Palmyrah


**Unit V Other spices and plantation crops**

Crops: Cumin, Ajowan, All Spice, Kokum, Paprika, Vanilla, Curry leaf, Thyme, Celery, Parsley, Betel vine

Origin and distribution - Area and production - Composition and uses - Soil and climate - varieties - seed/vegetative propagation - planting systems and methods - irrigation - nutrition management- harvesting and yield- GAP-Organic production - post harvest technologies - processing - value addition - storage

**Practical**

**Spices**

Identification of varieties - practices in propagation - main field preparation and lay out -seed treatment- sowing / planting - nutrient management - use of herbicides and plant growth regulators - training and pruning - study of maturity indices - harvesting - curing - visit to processing, essential oil and oleoresin extraction units - visit to spices research stations- Visit to private spice gardens raised under conventional system and precision farming system, organic spice gardens and industries - working out cost economics

**Plantation crops** - Raising nursery - propagation - softwood grafting in cashew - mother palm and seed nut selection of coconut and arecanut - nursery preparation - sowing seed nuts - nursery management - practice in manuring and root feeding in coconut - drip and fertigation - nutrient schedule - cropping systems and
intercropping in coconut, arecanut and palmyrah - visit to coffee board - study of varieties - nursery management – intercropping and top working – harvesting and processing in coffee – implements used for harvest - visit to plantation with multi tier cropping systems, High Density Planting systems, visit to cashew, rubber and cocoa fields – visit to private plantations - working out cost economics

**Lecture schedule**

1. Scope and importance of spices – History and development - Indian and world scenario of spice production – export and import of spices
2. Spice development in India –Institutions involved in spices research and development.
7. Coriander – importance - origin and distribution - area and production - composition and uses - varieties - soil and climate - propagation -sowing - nutrient, water and weed management – cropping systems – maturity indices -
harvest and yield - processing - storage - methods of extraction of essential oil - constraints.


11. History and development - scope and importance - Indian and world scenario of plantation crops.

12. Area and production of plantation crops - export and import potentials - role in national and state economy - institutions involved in research and development


17. Mid semester examination


24. All spice and Kokum - importance-origin and distribution-area and production-composition and uses- varieties - soil and climate - propagation - planting -


30. GAP in Spices and Plantation Crops

31. Organic Production of Spices and Plantation Crops

32. Precession farming in Turmeric and Coriander

33. IPR for Spices and Plantation Crops

34. Final theory examination.

**Practical schedule**

1. Identification of major spices and plantation crops varieties - Rapid multiplication technique and nursery management in black pepper.


7. Coconut and Areca nut - mother palm and seed nut selection - preparation of nursery - sowing of seed nuts and nursery management.


9. Harvesting, curing and cleaning of seed spices. Working out cost economics of spice crops.

10. Cashew - raising nursery and practicing grafting techniques


12. Visit to cashew, cocoa farmers field and cashew processing unit

13. Visit to spices processing, essential oil and oleoresin extraction units

14. Extraction of essential oil and oleoresin in spices

15. Visit to spices board and e- auction center for cardamom.

16. Working out cost economics of major spice crops

17. Practical examination

References

**e References**

- [http://www.indiastat.com](http://www.indiastat.com)
- [http://www.cabi.org/](http://www.cabi.org/)
- www.aicc.gov.ap
- http://www.spices.rec.in
- www.iisr.org
- www.kissankerala.ner
- www.coconutboard.nic.in

Journals
1. Indian J. Arecanut, Spices and Medicinal Plants
2. J. Plantation Crops
3. Spice India
4. Indian Journal of Horticulture
5. Indian Journal of Agriculture Sciences
HOR 204 Study Tour – I 0+1

Visit to places of commercial cultivation of fruits and vegetables in tropical temperate and sub-tropical zones of Tamil Nadu – study of cropping systems- varieties – constraints in production – marketing – economic analysis – case studies.

Practical schedule

1. Visit to SHF, Srivilliputhur.
2. Visit to SHF, Courtalam for sub-tropical fruits.
3. Visit to HRS, Pechiparai for high rainfall zone crops.
4. Visit to AC&RI, Killikulam for tropical fruits and vegetables.
5. Visit to ARS, Paramakudi and Ramanad for tropical fruits and vegetables.
6. Visit to RRS, Aruppukottai and AC&RI, Madurai for arid zone fruits.
7. Visit to HRS, Kodaikanal and Thadiyankudisai for sub-tropical and temperate fruits and vegetables.
ABT 201 Principles of Biotechnology 1 + 1

Aim

- To impart knowledge on basic principles of tissue culture, molecular biology and genetic engineering.

Theory

Unit I Basics in plant tissue culture

- History and concepts, Nutritional requirements, morphogenesis-organogenesis and embryogenesis, tissue culture techniques-callus and suspension cultures, shoot tip and meristem tip culture, anther and pollen culture, ovule and embryo culture, endosperm culture and protoplast culture.

Unit II Basics in molecular biology

- Structure of nucleic acids-an overview, central dogma of life - DNA replication, transcription and translation, fine structure of a gene, regulation of gene expression, polymerase chain reaction, blotting techniques, DNA sequencing methods.

Unit III Recombinant DNA technology

- Recombinant DNA, vectors: plasmids, phagemids, cosmids, BAC and YAC, DNA manipulation enzymes - polymerase, restriction endonucleases and ligases - construction of recombinant DNA molecules - bacterial transformation.

Unit IV Genetic transformation


Unit V Immunotechnology

- Antigens, antibodies and their structure, antigen-antibody interaction, monoclonal and polyclonal antibodies.

Practical

- Laboratory organization -sterilization techniques-preparation of MS medium - inoculation of explants - shoot tip and embryo culture-extraction of plasmid and plant genomic DNA. DNA quantification -quality assessment. Electrophoresis of DNA. Restriction digestion, ligation, competent cell preparation, bacterial transformation, blue
white colony screening. *Agrobacterium* mediated transformation and confirmation of genetic transformants- PCR. Antigen-antibody interaction - Ouchterlony double immunodiffusion.

**Lecture schedule**

1. History and concepts in plant tissue culture- totipotency, dedifferentiation and redifferentiation
2. Nutritional requirements for plant tissue culture
3. Morphogenesis- direct and indirect organogenesis and embryogenesis
4. An overview about different tissue culture techniques - Callus and suspension cultures, shoot tip and meristem tip culture, anther and pollen culture
5. Ovule and embryo culture, endosperm culture and protoplast culture
6. Structure of nucleic acids
8. Fine structure of gene and prokaryotic gene regulation - Lac operon
9. Mid semester examination
10. Polymerase Chain Reaction, blotting techniques and DNA sequencing methods
11. Recombinant DNA, vectors - plasmids, phagemids, cosmids, BAC, YAC
12. DNA manipulation enzymes- polymerase, restriction endonucleases and ligases
13. Construction of recombinant DNA molecules and bacterial transformation
15. Methods of gene transfer- microinjection, electroporation, particle bombardment, *Agrobacterium* mediated methods
16. Antigens, antibodies and their structure, antigen-antibody interaction
17. Monoclonal, polyclonal antibodies and hybridoma technology

**Practical schedule**

1. Laboratory organization and sterilization techniques
2. Preparation of MS medium
3. Inoculation of explant - shoot tip
4. Embryo culture
5. Preparation of reagents for plasmid and DNA isolation
6. Isolation of plasmid DNA from bacteria
7. Extraction of genomic DNA from leaf tissue
8. Quantification of DNA by spectrophotometer
9. Genomic DNA visualization using agarose gel electrophoresis
10. Restriction digestion and ligation
11. Competent cell preparation
12. Bacterial transformation and blue white colony screening
13. Demonstration of Agrobacterium mediated transformation method
14. Amplification of DNA using thermocycler
15. Analysis of PCR products in agarose gel electrophoresis
16. Ouchterlony double immunodiffusion
17. Practical examination.

**Outcome**

Students will acquire both basic knowledge and hands on experience in plant tissue culture, molecular biology and genetic engineering

**Text books**


**Further reading**

References

- www.cellbio.com1
- http://www.tamu-commerce.edu/coas/agscience/clasnote/pls497/PlantTissueWeb
- http://www.uni-bonn.de/-ulp50bltissuecultture.htm
- www.gramene.org
- www.nias.go.jp
SST 212 Seed Production Technology of Horticultural Crops 1 + 1

Theory

Unit I  Introduction to seed production

Seed production – importance – seed and crop production – variety and hybrid seed production - factors influencing seed production. - seed production planning

Unit II  Seed production in tropical vegetables

Seed production in tomato, brinjal and chilli (solanaceae) - bhendi – malvaceae) and cowpea, lablab and cluster bean (fabaceae) – ash gourd, bitter gourd, ribbed gourd, snake gourd and bottle gourd (cucurbitaceae) - onion (alliaceae), amaranthus (amaranthaceae) moringa (oleiferae) and yam (amaryllidaceae)

Unit III Seed production in temperate vegetables

Seed production in cabbage, cauliflower (cruciferae) - carrot (umbelliferae) and beetroot (chenopodiaceae) - peas and french beans (fabaceae) - potato (solanaceae)

Unit IV  Seed production in annual flowers and medicinal plants

Seed production - flower crops – marigold, petunia and cock’s comb – medicinal plants -ashwagandha , periwinkle, senna and phyllanthus

Unit V Seed handling in spices, plantation and fruits crops

Seed production - coriander and fenugreek –seed handling in plantation crops- cocoa, cashew, coffee and coconut –fruit crops- aonla and jamun, difference between Orthodox and recalcitrant seeds

Lecture schedule

1. Seed production – importance – seed and crop production – variety and hybrid seed production and factors influencing seed production
2. Seed production planning for horticultural crops (variety and hybrid)
3. Seed production in tomato, brinjal and chilli (solanaceae)
4. Seed production in bhendi (malavaceae) cowpea, lablab and cluster bean (fabaceae)
5. Seed production in ash gourd, bitter gourd, ribbed gourd, snake gourd and bottle gourd (cucurbitaceae)
6. Seed production in onion (alliaceae), amaranthus (amaranthaceae) moringa (oleiferae) and yam (amaryllidaceae)

7. Seed production in cabbage, cauliflower (cruciferae)

8. Seed production in carrot(umbelliferae) and beetroot (chenopodiaceae)

9. Mid semester examination

10. Seed production in peas and french beans (fabaceae)

11. Seed production in potato (solanaceae )

12. Seed production in marigold, petunia and cock’s comb

13. Seed production in ashwagantha , periwinkle , Senna and phyllanthus

14. Seed production in coriander and fenugreek

15. Seed production in cocoa ,cashew ,coffee, and coconut

16. Seed handling techniques in aonla and jamun

17. Orthodox and recalcitrant seed behavior in horticultural crops

Practical

Planning seed production - identification of off types in vegetables seed production plot - - emasculation and dusting techniques (tomato/ brinjal /okra) - different seed extraction methods – pre- germinated seed and ethrel spray in cucurbits - visit to vegetable seed industry - dormancy breaking treatments - visit to seed production plots of temperate vegetables (ICHS, Ooty) - seed grading techniques - seed production standards for vegetative propagules - visit to seed potato production plots - germination enhancement techniques – tropical vegetables - temperate vegetables - medicinal crops - flower crops - pre-storage seed treatment and packing materials - seed storage structures and godown maintenance - recalcitrant seed storage.
Practical schedule

1. Planning seed production
2. Identification of off types in vegetables seed production plot
3. Practising emasculation and dusting techniques (tomato/brinjal/okra)
4. Practising different seed extraction methods
5. Study on pre germinated seed and ethrel spray in cucurbits
6. Visit to vegetable seed industry
7. Practising dormancy breaking treatments
8. Visit to seed production plots of temperate vegetables (ICHS, Ooty)
9. Practising seed grading techniques
10. Study on seed production standards for vegetative propagules
11. Visit to seed potato production plots
12. Germination enhancement techniques in tropical and temperate vegetables
13. Germination enhancement techniques in flower and medicinal crops
14. Practising pre storage seed treatment and packing materials
15. Study on seed storage structures and maintenance
16. Study on recalcitrant seed storage
17. Final practical examination

References

Text book


Further reading


Journals

1. Asian seed and planting material
2. Seed Research
3. Journal of Asian Horticulture
4. Indian Horticulture
5. Agriculture and industry survey
6. Seed Science and Technology
7. Journal of Seed Science Research

e Reference

www.dare.gov.in
http://sfc.nic.in
www.iar.org.in/Directorate1.htm
www.apsa.org
www.seedassociationofindia.com
www.apaseed.com
www.apaseed.org
SER 201 Sericulture Technology  1 + 1

Theory

Unit I


Unit II

Pruning and harvesting – pests, diseases and nematodes of mulberry and their management.

Unit III


Unit IV

Unit V


Lecture schedule

9. Mid semester examination
Seribiotechnology

Practical schedule
4. Identification of pests of mulberry and damage symptoms.
5. Identification of symptoms of diseases and nematodes of mulberry.


10. Integrated Farm System with Sericulture in Integrated Farming system – Mechanization in sericulture.


14. Economics of silkworm rearing.

15. Visit to CSR&TI, Mysore; CSB, CSTR, SSTL and SBRL Institutes at Bangalore


17. Final Practical Examination.

**Assignment**

1. Rearing of 50 larvae of silkworm from larva to cocoon by each student

2. Group assignments and individual assignments on various aspects of Sericulture.

**Outcome**
1. The course gives an exposure to the students on mulberry cultivation, silkworm rearing, post cocoon technologies, non-mulbery sericulture and value addition of sericulture by products.

2. Hands on training of sericultural technologies would strengthen the knowledge base of the students for establishing commercial sericultural enterprise.

References


e references

- www.silkbase.org
- www.papilo.ab.a.u.tokyo.ac.jp

Journals

- Indian Journal of Sericulture – published from CSR&TI, Mysore
- Indian Silk – published from Central Silk Board, Bangalore
ARM 201 Fundamentals of Agribusiness Management 1 + 1

Aim
❖ To expose the students to the structure and scope of agribusiness
❖ To make the students familiar with management functions
❖ To expose the students on the functional areas of agribusiness management and their applications

Theory
Unit I Agribusiness
1. Agribusiness – definition – structure of agribusiness (input, farm and product sectors)
2. Agribusiness management – special features of agribusiness – importance of agribusiness in Indian economy.

Unit II Management
3. Management – definition and importance – management functions – nature
4. Management - skills, levels and functional areas of management
5. Forms of business organisation – sole proprietorship – partnership – private and public limited, cooperatives, MNCs

Unit III Management functions I
6. Planning – definition – types of plans (purpose or mission, goals or objectives, strategies, policies, procedures, rules, programmes, budget)
7. Steps in planning – characteristics of sound plan. Objectives – MBO
9. Mid semester examination

Unit IV Management functions II
14. Leadership – definition – styles – difference between leadership and management

Unit V Management functions III

16. Project- definition- project cycle- identification- sources of projects
17. Formulation- issues and budgeting the project, appraisal

Practical schedule

1. Exercise on operations management in agribusiness firms
2. Logistics management
3. Inventory management - inventory types, costs and economic order quantity
4. Procurement systems and vendor rating methods
5. ABC analysis
6. Exercise on supply chain management
7. Market research and segmentation
8. Demand forecasting methods
9. Visit to agri hi-tech bank branch / commercial banks/RRB/ NABARD
10. Exercises on human resource planning and management
11. Farmers survey – buying behaviour of agricultural inputs
12. Market promotion measures
13. Pricing methods
14. Assessing and acquiring finance for agribusiness firms
15. Procedure and constraints in establishing agro based industries
16. New agribusiness venture proposal preparation
17. Final practical examination

Outcome

1. The student will be familiar with the important activities and scope of agribusiness and will be able to understand the essence of management functions.
2. The Students would gain knowledge in the different functional areas of agribusiness namely Production, Human Resource Management, Marketing, Finance and project management.

References


e references

- www.managementteacher.com
- www.management.about.com
- www.bized.co.uk
- http://managementhelp.org/
- www.entrepreneurship.org
- www.fma.org
- http://www.ifmr.ac.in

STA 201 Applied Statistics 1 + 1

Aim

To provide a good knowledge of basic statistical techniques for the analysis and interpretation of data including descriptive statistical measures, tests of significance and applications of various design of experiments.
Theory

Unit I Descriptive statistics

Measures of central tendency: arithmetic mean, geometric mean, harmonic mean, median and mode – properties – Measures of dispersion: range, standard deviation, variance and coefficient of variation – properties. Computation of the above measures for raw data.

Unit II Probability distributions and sampling theory

Distributions – theoretical distribution – binomial, poisson and normal distributions – definitions and properties.


Unit III Tests of significance

Tests of significance – large sample test – single mean and difference between two means – single proportion and difference between two proportions. Small sample tests – t-test for testing the significance of single mean – independent t-test (equal variances only) and paired t test – chi square test for testing the association of a 2 x 2 contingency table.

Unit IV Correlation and regression

Correlation – Karl Pearson’s correlation coefficient – computation – properties of correlation coefficient.

Regression – simple linear regression – fitting of simple linear regression equation of y on x – properties of regression coefficient.

Unit V Analysis of variance and experimental designs

Analysis of variance (ANOVA) – assumptions – one way ANOVA – two way ANOVA.
Experimental designs – randomization, replication and local control – completely randomised design (CRD) (for equal replications) – randomised block design (RBD) – latin square design (LSD).

Practical


Testing of hypothesis – large sample test – single mean and difference between two means – single proportion and difference between two proportions – small samples test – t-test for testing the significance of single mean – testing the significance of two means for independent samples (equal variance only) and paired t test – chi square test for testing the association of a 2 x 2 contingency table.


Experimental designs – analysis of completely randomised design (CRD) (for equal replications only), randomised block design (RBD) and latin square design (LSD) – analysis of CRD, RBD and LSD using software package (AGRES).

Lecture schedule

1. Introduction – definition of statistics – data – qualitative and quantitative classification – tabulation
2. Measures of Central Tendency – definition – mean, geometric mean, harmonic mean median and mode for raw data – properties
3. Measures of Dispersion – definition – range, standard deviation, variance and coefficient of variation for raw data – properties
4. Distributions - Binomial distribution and Poisson distribution
5. Normal distribution and standard normal distribution - definition - properties
6. Population - sample - sampling - sampling vs complete enumeration - parameter and statistic - need for sampling - deliberate sampling - probability sampling method - simple random sampling - selection using random numbers
7. Tests of significance - basic concepts - null and alternative hypothesis - level of significance - critical region - degrees of freedom - test statistic - types of errors - type I and type II error - standard error and its uses
8. Large samples test - single mean and difference between two means - single proportion and difference between two proportions
9. Mid semester examination
10. Small sample tests - t-test for single mean and difference between two means for equal variances - paired t test - chi square test for testing the association of a 2 x 2 contingency table
11. Correlation - meaning - assumptions - scatter diagram - types - positive and negative correlation - Karl Pearson’s correlation coefficient - definition - computation and interpretation of correlation coefficient - properties of correlation coefficient - uses of correlation analysis
13. Analysis of Variance - definition - assumptions - uses - one way and two way ANOVA
14. Experimental designs - basic concepts - experiment, experimental unit, treatment, block, experimental error - Principles of experimental design - randomization, replication, local control
15. Completely randomised design (CRD) - for equal replications only - randomization - analysis (one way analysis of variance)
16. Randomised block design (RBD) - randomization - analysis (two way analysis of
17. Latin square design (LSD) – randomization – analysis

**Practical schedule**

1. Computation of arithmetic mean, geometric mean, harmonic mean, median and mode for raw data  
2. Computation of range, standard deviation, variance, coefficient of variance for raw data – calculation of the above measures using MS Excel functions  
3. Simple problems in Binomial distribution and Poisson distribution  
4. Simple problems in Normal distribution  
5. Selection of sample using simple random sampling method  
6. Large sample test – test for single proportion and difference between two proportions  
7. Large sample test – test for single mean and difference between two means  
8. Small samples test – t-test for single mean – t test for difference between two sample means (equal variances only)  
9. Paired t-test  
10. Chi square test for testing the association of a 2 x 2 contingency table  
11. Computation of Karl Pearson’s correlation coefficient  
12. Fitting of simple linear regression equation y on x – correlation and regression using MS Excel functions  
13. Analysis of Completely Randomised Design (CRD) – for equal replications only  
14. Analysis of Randomised Block Design (RBD)  
16. Field visit  
17. Final practical examination

**Outcome**

1. The students will acquire skills in statistical analysis manually and using statistical packages and interpretation of data collected from agricultural experiments.
Text Books


Reference Books


e reference

- http://www.statistics.com/resources/glossary/
- www.statsoft.com
- www.stats.gla.ac.uk/steps/glossary/index.html
- http://davidmlane.com/hyperstat/
- http://www.statsoft.com/
- http://www.stat-help.com/
- www.statsci.org/jourlist.html
SWE 211 Fundamentals of Soil and Water Conservation Engineering

Theory

Unit I Surveying

Surveying and levelling – chain, compass and plane table survey – levelling – land measurement and computation of area – Simpson’s rule and Trapezoidal rule.

Unit II Soil erosion


Unit III Soil conservation


Unit IV Irrigation and drainage

Unit V Wells and Pumps


Practical


Lecture schedule

1. Introduction - land surveying - uses in agriculture.
2. Chain cross staff and compass surveying - computation of angles.
3. Radiation, intersection and traversing.
4. Dumpy level - setting, observation and tabulation of readings - computation of land slope - difference in elevation.
5. Computation of area and volume – Simpson’s rule and Trapezoidal rule.
7. Water erosion - causes - erosivity and erodibility - mechanics of water erosion
8. Splash, sheet, rill and gully erosion - ravines - land slides
10. Effects of water and wind erosion
12. Cropping systems – vegetative barriers - windbreaks and shelterbelts - shifting cultivation
13. Mechanical measures – contour bund – graded bund
14. Broad beds and furrows – basin listing – random tie ridging
15. Mechanical measures for hill slopes – contour trench – bench terrace – contour stone wall
17. Mid semester examination.
18. Farm ponds – percolation ponds.
19. Irrigation - measurement of flow in open channels - velocity area method
20. Rectangular weir - Cipoletti weir - V notch
21. Orifices - Parshall flume
22. Duty of water - irrigation efficiencies
23. Conveyance of irrigation water - canal lining
24. Underground pipe line system
26. Surface irrigation methods - borders, furrows and check basins
26. Components of drip and sprinkler irrigation system
27. Agricultural drainage – need - surface drainage systems
28. Surface drainage systems - drainage coefficient
29. Groundwater occurrence – aquifers types
30. Types of wells and sizes
31. Pump types – reciprocating pumps – centrifugal pumps
32. Turbine pumps – submersible pumps
33. Jet pumps – Airlift pumps
34. Selection of pumps – operation and their maintenance.

**Practical schedule**

2. Chains and cross staff surveying - linear measurement - plotting and finding areas.
5. Levelling – fly levels – determination of difference in elevation.
6. Contouring – area and volume computation.
7. Design of contour bund and graded bund.
8. Visit to erosion affected areas.
9. Layout of sprinkler and drip systems.
10. Problems on water measurement.
11. Problems on duty of water, irrigation efficiencies.
13. Study of different types of wells and its selection.
14. Study of reciprocating pump & centrifugal pump
15. Study of submersible pumps & jet pumps
16. Selection of pumps.
17. Practical examination.

Text books

Reference books

References

- [http://www.eng.uwi.tt/depts/mech/ugrad/courses/31d.html](http://www.eng.uwi.tt/depts/mech/ugrad/courses/31d.html)

Journals

- ASCE journal of irrigation and drainage engineering
- ISAE Journal of agricultural engineering
- Journal of the Indian society of soil and water conservation published by CSWCRTI, Dehradun
Theory

Unit I Energy scenario

Introduction - energy crisis - energy sources - classification - availability - renewable energy sources - significance - potential and achievements in India. Energy requirements of important horticultural crops.

Unit II Methods of energy conversion and biogas technology

Methods of energy conversion - thermochemical and biochemical conversion methods - combustion, pyrolysis and gasification - applications - biogas and ethanol production - applications.

Biogas technology - science of production - feed stocks - factors affecting biogas production - types and capacity of biogas plants - KVIC, Janatha and Deenbandhu model biogas plants - construction and working principles - comparison features of biogas plants. Applications of biogas - biogas requirements - biogas appliances - environmental considerations - enrichment and uses of biodigested slurry (BDS).

Unit III Thermochemical conversion methods


Unit IV Applications of solar energy


Unit V Wind energy, energy plantation and bio-fuels

Wind energy - types of wind mills - constructional details and applications. Energy crops - definition and use of energy plantation - availability - selection of species - calorific value and rating index - calculation of area needed for power production from

**Lecture schedule**

1. Energy crisis-renewable energy sources- significance- potential and achievements in India-energy requirements of important crops like banana, mango, areca nut, coconut, etc.
2. Methods of energy conversion – thermo chemical conversion methods- principles of combustion, pyrolysis and gasification and applications- biochemical conversion methods – biogas and ethanol production- principles- applications.
3. Biogas technology-science of production of biogas- feed stocks used - factors affecting biogas production- types of biogas plants- capacity determination.
4. Biogas plants - construction and working principles – KVIC, Janata and Deen bandhu model biogas plants- performances.
5. Applications of biogas – biogas requirements for cooking, lighting and engine operation and electricity production- biogas appliances-environmental considerations - enrichment and uses of biodigested slurry(BDS).
9. Mid semester examination
devices - solar water heaters - principle and applications - solar cookers - evacuated tube collector.


15. Energy available in wind - wind mills - types - water pumping windmills - components - wind power transmission - controls - applications - aerogenerator - components - working principle - types of rotors - wind power transmission - power generation - controls - applications.


Text books


Reference books


e references

- Renewable Energy - An International Journal - ISSN: 0960-1481 Imprint-ELSEVIER  
  http://www.elsevier.com/wps/find/journaldescription.cws_home/969/  
FOR 211 Forest Resource Management 1 + 1

Aim

- To know the importance and significance of forest and agroforestry
- To understand the various forest operations
- To meet the demands of various end users on a sustainable basis in an eco-friendly manner.

Theory

Unit I Forestry and forest regeneration

Indian forest -- forestry -- role of forests -- classification of forests - silvics - silviculture locality factors -- regeneration of forests -- natural and artificial regeneration

Unit II Silvicultural techniques for tree species

Site selection - choice of species - modern silvicultural techniques in site preparation - planting and tending operations - mechanization in silviculture - silvicultural packages for timber species (teak, sal, sandal wood and rosewood), pulpwood species (eucalyptus, casuarina, bamboo), Fuel wood species (acacias, prosopis), match wood species (ailanthus, melia), tree borne oilseeds (neem, pungam, bassia), fodder trees (subabul, white babul).

Unit III Forest utilization

Forest utilization -- wood and non-wood forest products -- solid wood- timber-wood composites- plywood, fibre board and particle boards -- non wood forest products

Unit IV Agroforestry

Social forestry concepts and applications --JFM concepts - agroforestry-agroforestry classification -agroforestry systems for different agro climatic zones of Tamil Nadu --distinction between social forestry and agroforestry

Unit V Urban and recreation forestry

Techniques and management of urbanforestry and recreation forestry -- ecotourism concepts and applications.

Practical

Lecture schedule

1. Indian forest – forest – forestry – classification of forest – role of forests – production and protection role.
3. Regeneration techniques for forest trees – natural regeneration.
5. Silvicultural techniques for some primary timber species – teak, sal, rose wood and sandal
7. Silvicultural techniques for some TBOs & Fodder – neem, pungam, and bassia, subabul and white babul
8. Silvicultural techniques for some fuel wood species – (acacias, prosopis) and match wood species (ailanthus and melia)
9. Mid semester examination
11. Forest utilization – non wood forest products (fibres, flosses, grasses, bamboos and canes) – value addition to non wood forest products.
12. Non wood forest products (oil, tannin, dyes, gum, resins) – status and value addition.
13. Social forestry concepts, history, objectives and applications – JFM concepts.
14. Agroforestry –agroforestry concepts, objectives and classifications - distinction between social forestry and agroforestry

15. Agroforestry systems and their applications for different agro climatic zones of Tamil Nadu.

16. Techniques for urban forestry ,recreation forestry


**Practical schedule**

1. Nursery layout and other nursery techniques.
2. Nursery technology for teak and sandal, dalbergia, neem
3. Nursery technology for rose wood
4. Nursery technology for eucalyptus
5. Nursery technology for casuarina.
6. Nursery technology for bamboo and acacia
7. Nursery technology for TBO's.
8. Visit to a forest nursery to study the nursery techniques
9. Visit to a agro forestry model unit.
10. Clonal propagation techniques for forest trees.
11. Practicing tree planting techniques.
12. Practicing tending and cultural operations in forest plantations.
13. Visit to pulp and paper manufacturing industry
14. Study of plywood production technology – visit to plywood industry.
15. Study of match manufacturing process – visit to matchwood industry.
16. Visit to a NWFP value addition unit
17. Practical examination.

**Outcome**

1. The students will acquire basic knowledge on forestry and agroforestry.
2. They will gain confidence in establishing forest nursery and plantations.
3. They will gain knowledge on wood and non wood forest products and its utilization.

**References**
Text Books


Further reading

3. Indian Journal of Forestry
4. Indian Journal of Agroforestry

e references

- www.ITTI.com
- www.swsc.com
- www.Candia.com
- www.ICRAF.com
- www.Foris.com
<table>
<thead>
<tr>
<th>Sl. No</th>
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<th>Credit Hours</th>
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<td>FLG 307</td>
<td>Protected and Precision Horticulture</td>
<td>2 + 1</td>
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<tr>
<td>2.</td>
<td>FLG 301</td>
<td>Production Technology of Commercial Flower crops</td>
<td>2 + 1</td>
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<td>3.</td>
<td>PSM 301</td>
<td>Production Technology of Medicinal and Aromatic crops</td>
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<td>AEC 301</td>
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<td>Principles and Methods of Plant Breeding</td>
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FLG 307 Protected and Precision Horticulture 2 + 1  
(Team teaching – Hort & Remote Sensing)

Aim

- To impact 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.

Theory

Unit I Importance and methods of protected culture in horticultural crops


Unit II Protected cultivation technology for vegetable crops

Hi-tech protected cultivation techniques for tomato, capiscum nursery, cucumber, gherkins strawberry and melons – integrated pest and disease management – postharvest handling.

Unit II Protected cultivation technology for flower crops

Hi-tech protected cultivation of cut roses, cut chrysanthemum, carnation, gerbera, asiatic lilies, anthurium, orchids, cut f oliages and fillers – integrated pest and disease management – postharvest handling.

Unit IV Concept and introduction of precision horticulture

Importance of precision horticulture – definition, principles and concepts – Role of geographic information systems (GIS) – global positioning systems (GPS) - Mobile mapping system and its application in precision farming – design, layout and installation of drip and fertigation in horticultural crops - role of computers in developing comprehensive systems needed in site specific management (SSM) –

**Unit V Precision farming techniques for horticultural crops**

Precision farming techniques for tomato, chilli, bhendi, bitter gourd, bottle gourd, cauliflower, cabbage, grapes, banana, rose, jasmine, chrysanthemum, marigold, tuberose, china aster, turmeric, coriander, coleus and gloriosa.

**Practical**


**Lecture schedule**

1. Importance and scope of protected cultivation.
2. Different growing structures of protected culture viz., poly house, net house, poly tunnels and screen house.
3. Study of environmental factors influencing protected culture, roofing materials and ventilation systems.
4. Cladding / glazing / covering and roofing materials and ventilation systems.
5. Nutrient film techniques, hydroponics, aeroponic culture
6. Growing media and nutrients for protected cultivation.
8. Protected cultivation techniques for tomato
9. Green house cultivation techniques for cucumber, gherkins and melons.
10. Protected cultivation techniques for capsicum and strawberry
11. Integrated pest and disease management for vegetable crops in protected cultivation.
12. Integrated pest and disease management for flower crops in protected cultivation.
13. Protected cultivation techniques for roses and gerbera
14. Protected cultivation techniques for chrysanthemum and carnation.
15. Protected cultivation techniques for anthurium and orchids.
16. Protected cultivation techniques for cut foliages and fillers.
17. Mid semester examination
18. Precision horticulture – definition, principles and concepts.
19. Geographic information system (GIS) and its application in precision farming.
20. Global positioning system (GPS) and its application in precision farming.
22. Precision equipments for seeding and chemical application
23. Role of computers in developing comprehensive system needed in site specific management (SSM) system and postharvest process management (PPM)
25. Georeferencing and photometric correction
26. Sensors for information gathering, geostatistics and robotics in horticulture
27. Design, layout and installation of drip and fertigation in precision farming
28. Information and data management, crop growth models and GIS based modeling.
29. Precision farming techniques for grapes and banana.
30. Precision farming techniques for tomato, chilli and bhendi.
31. Precision farming techniques for bitter gourd, bottle gourd, cauliflower and cabbage.
32. Precision farming techniques for coleus and gloriosa.
33. Precision farming techniques for rose, jasmine, chrysanthemum marigold china aster and tube rose
34. Precision farming techniques for turmeric and coriander.

**Practical schedule**

1. Study of different protected structures – designs, components, orientation and construction of greenhouse.
2. Types and structures of auto control system in green house.
3. Study of heating and cooling systems in green house.
4. Study of different media, solarization and fumigation for green house cultivation.
5. Study of special cultural practices for production of vegetable crops under protected cultivation.
6. Study of special cultural practices for flower crops under protected cultivation.
7. Visit to protected culture units.
8. Project preparation of protected cultivation of important horticultural crops.
10. Study of soil salinity, soil compaction, soil test crop response (STCR) and gird soil sampling.
11. Practicing design and layout of precision farming system
12. Canopy management in precision farming
13. Water use efficiency in annual, perennials and landscape horticulture
15. Project preparation of precision cultivation in important horticultural crops
16. Searching internet resources for precision horticulture
17. Practical examination

**References**


Further reading
2. David Reed. 1996. Water, media and nutrition for green house crops. Ball publishing USA.

References
- www.icar.org.in/ciphet.html
- www.jains.com
- www.gisdevelopment.net
- www.lasercladding.com
- www.epa.gov

Journals
- Hort. Science
- Horticultural Technology
- Floriculture Today
- Hi-tech Horticulture
FLG 301 Production Technology of Commercial Flower Crops 2 + 1

Aim

❖ To educate the students on commercial cultivation of loose flowers, protected cultivation of cut flowers and value addition in flower crops.

Theory

Unit I Principles of growing commercial flowers


Unit II Loose flowers

Soil and climate - botany - species and varieties - propagation - principles and practices - planting systems and methods - pinching, training and pruning practices - nutrient and water management - role of growth regulators - intercultivation - Harvest and yield of crossandra, marigold, nerium, gomphrena, celosia and china aster.

Unit III Principles of protected cultivation

Protected structures - controlled environmental conditions - Soil sterilization - factors influencing protected cultivation - cut flower production - flower forcing.

Soil and climate - Botany - species and varieties - propagation - principles and practices - planting systems and methods - pinching, training and pruning practices - nutrient and water management - role of growth regulators - intercultivation - Harvest and yield of cut roses, carnation, gerbera, cut chrysanthemum and gladiolus.
Unit IV Cut flowers


Unit V Post harvest handling of flowers


Practical

Botany - description and identification of species and varieties in rose, jasmine, crossandra, chrysanthemum, tuberose, marigold, nerium, gomphrena, celosia, cut rose, carnation, gerbera, gladiolus, orchids and anthurium – propagation and planting-seed treatment and sowing-planting of tubers and suckers-lay out and planting of rose and jasmine-media preparation and potting of orchids and anthurium – After culture practices in rose, jasmine, chrysanthemum, marigold and dahlia-harvesting, postharvest handling and storage-extraction of floral concrete from rose, jasmine and tuberose-visit to commercial fields, extraction units and flower markets-working out benefit cost ratio for loose flowers and cut flowers-preparation of project reports for fresh flower production and floral concrete extraction.

Lecture schedule

1. History and importance-area and production-export potential-industrial importance-floriculture industry in India and Tamil Nadu
2. Rose-importance and uses-origin and history- area and production – botany – species and varieties– classification.
4. Jasmine- importance and uses–origin and history- area and production – botany – species and varieties
11. Celosia and China aster importance and uses-origin and history- area and production – botany – species and varieties–propagation - season and planting-
nutrition and irrigation – management practices -role of growth regulators- plant protection -harvest and yield.

12. Field visit – Loose flower growing areas and exporters

13. Economics - loose flower production

14. Designing and erection of controlled structures for cut flower production

15. Flower forcing and factors affecting flower production under controlled atmospheric conditions.


17. Mid semester examination


19. Gerbera -importance and uses-origin and distribution-area and production- botany and varieties -propagation and planting-media - inter culture - production constraints-harvesting and yield.


25. Guest lecture – Cut flower production


27. Post harvest - principles and methods of extension of shelf life


29. Methods of floral concrete extraction from rose, jasmine and tuberose

30. Natural dye extraction of flower crops.

31. Packaging, grading and export standards for important commercial flowers.

32. Industry visit – Dye extraction / Concrete extraction

33. Economics – cut flower production

34. Constraints in flower production and future thrust.

**Practical schedule**


3. Tuberose and crossandra – identification, description of species/varieties, propagation and planting

4. Chrysanthemum and marigold- identification and description of species/varieties - propagation and planting
5. Nerium and gomphrena - identification, description of species/varieties, nursery raising and planting
6. Celosia and china aster - identification, description of species/varieties, nursery raising and planting
7. Visit – Flower market and flower growing areas – loose flowers.
8. Preparation of project – loose flower production – open condition
10. Carnation and gerbera - identification and description of species/varieties – media – planting
11. Cut chrysanthemum and gladiolus - identification and description of species/varieties – media – planting
15. Visit to flower growing areas – Cut flowers
16. Rose, jasmine and tuberose-extraction of floral concrete – lecture / Field visit
17. Preparation of project – Cut flower production – controlled condition
18. Practical examination

Reference books

Journals

- Ind. J. of Hort. The Horticultural Society of India, Indian Agricultural Research Institute, New Delhi.
- J. South Indian Hort., South Indian Horticultural Society, TNAU, Coimbatore.
- J.ornamental Hort.
PSM 301 Production Technology of Medicinal and Aromatic Crops 2 + 1

Aim

- To impart knowledge on the current status and export potential of medicinal and aromatic plants.
- To sensitize the students on hi-tech production technology and extraction methods.

Theory

Unit I Importance and scope of medicinal crops

Importance and scope - medicinal plant wealth of India and states - area and production - exports and imports - Demand of medicinal plants in phytochemicals and AYUSH - Conservation strategies, ex situ and in situ - Classification of medicinal plants based on family, habit, climate, soil and ecological factors - Organized production - GAP, GMP guidelines, contract farming - Institutions for promotion of medicinal plants - Constraints and challenges in production.

Unit II Production technologies of medicinal crops I


Unit III Production technologies of medicinal crops II


Unit IV Importance and scope of aromatic crops

Importance and scope - aromatic plant wealth of India - area and production - exports and imports of essential oil - Demand of aromatic crops in perfumery and cosmetic industries - International standards for perfumes - Classification of essential oils - Methods of distillation of essential oil - Fractional distillation - Aromatherapy.
Unit V Production technologies of aromatic crops


Practical
Botany – Identification and description of varieties – parts used and their products – propagation techniques – processing methods – active principle and extraction of essential oil content of senna, periwinkle, glory lily, ashwagandha, phyllanthus, medicinal coleus, isabgol, aloe, gymnema, acorus, andrographis, medicinal dioscorea, rauvolfia, digitalis, ocimum, davana, mint, long pepper, lemon grass, citronella, geranium, palmarosa and vetiver.
Lecture schedule

1. Importance and scope – current status – Medicinal plant wealth of India and states – Area and production- Exports and imports- Demand in AYUSH and phytochemicals – medicinal plant wealth of India and states – area and production.

2. Conservation of medicinal and aromatic plants-Strategies and methods

3. Classification system in medicinal plants based on family, habit, climate, soil and ecological conditions

4. Promotional organizations involved in medicinal plants production - Policies, guidelines

5. Organised production of medicinal crops- Contract farming- Need for GAP, GMP

6. Opportunities, challenges and constraints in medicinal plants


17. Mid semester examination
18. Importance and scope- current status on area and production of aromatic crops- Exports and imports of essential oil
19. Demand of aromatic crops in perfumery and cosmetic industries – Classification of essential oils


30. Methods for extraction of secondary metabolites in medicinal plants

31. Methods of distillation of essential oil from aromatic plants

32. Fractional distillation of essential oil

33. Quality standards in medicinal and aromatic plants

34. Aromatherapy and use of essential oil in various ailments

**Practical**

1. Identification of major medicinal crops – parts used and their products
2. Identification of major aromatic crops- essential oil content
3. Study of varieties, propagation techniques of Senna and Periwinkle
4. Study of varieties, propagation techniques of ashwagandha
5. Study on propagation, pollination, standards in glory lily
6. Study of propagation techniques of medicinal coleus and aloe
7. Study of varieties, propagation techniques of vallarai and vasambu
8. Study of propagation techniques, use of media, growth regulators for rooting of long pepper.
9. Study of seed treatment techniques for enhancing germination of noni
10. Study of species, propagation techniques of Mint and Rosemary
11. Study of species, propagation techniques of Ocimum and Davana
12. Working out the benefit cost ratio for medicinal Coleus and Glory lily
13. Working out the benefit cost ratio for Ocimum and Davana
14. Extraction of medicinal products using Soxhlet apparatus
15. Distillation of essential oil from aromatic crops using Clevenger apparatus
16. Visit to commercial medicinal and aromatic plantation
17. Practical examination

**Text Books**


**Further reading**


**e references**

- [www.herbs.org](http://www.herbs.org)
- [http://www.intuxford.tripod.com](http://www.intuxford.tripod.com)
- [www.nmpb.nic.in](http://www.nmpb.nic.in)
- [www.agrobiosindia.com](http://www.agrobiosindia.com)
- [www.frlht.india.org](http://www.frlht.india.org)
- www.traffic.org.
- http://www.pubmed.com

**Journals**
- Amruth
- Journal of medicinal and aromatic plants
- Journal of Indian Perfumer
Practical

Practical training - cum - cultivation in vegetable, flower and spice crop production in any two transplanted crop (tomato, brinjal, chilli, marigold, gomphrena) and any two direct sown crop (bhendi, amaranth, radish, aggregatum onion, vegetable crops coriander) - seed treatment - raising nursery - sowing seeds - field preparation - transplanting, manuring, irrigation, weed control, inter culture - plant protection and harvesting - postharvest handling - seed extraction - maintenance of cultivation sheet - working out benefit/cost ratio.

Practical Schedule

1. Practice in raising nursery for transplanted vegetables.
2. Seed treatment, sowing and after care.
3. Practicing application of FYM and main field preparation.
4. Formation of beds, ridges and furrows.
5. Application of basal dressing of fertilizers.
6. Practising transplanting of vegetables.
7. Practising herbicide application.
8. Practising scheduling of irrigation.
10. Practising top dressing and earthing up operation.
11. Practising PGR preparation and application.
12. Practising pesticide, fungicide application and other inter cultural operations.
13. Practising harvest and assessing maturity index
14. Practising seed extraction, processing, cleaning, grading, packaging and marketing.
15. Practising grading, packaging and marketing
16. Cost economics of production
17. Practical examination
18. Practising raising nursery for transplanted flower and spice crops
19. Seed treatment, sowing, after care and collection of stubbles
20. Practising application of FYM.
21. Formation of beds, ridges and furrows.
22. Application of basal dressing of fertilizers.
23. Practising transplanting and direct sowing of spice crops.
24. Practising herbicide application.
25. Practising scheduling of irrigation.
27. Practising top dressing and earthing up operation.
28. Practising PGR preparation and application.
29. Practising pesticide, fungicide application and other inter cultural operations.
30. Practising harvest and assessing maturity index.
31. Practising seed extraction, processing, cleaning, grading, packaging and marketing.
32. Practising grading, packaging and marketing.
33. Cost economics of production.
34. Practical examination.

Reference books


twice

- www.ashs.org
- www.ag.vidho.edu/mg/handbook/mgh_19.pdf
- www.ikisan.com
- http://www.hort.purdue.edu
- http://pods.dasnr.okstate.edu
- http://www.avrdc.org
- http://www.entm.purdue.edu/entomology
- http://www.ces.ncsu.edu
- http://www.istra.ncat.org/attrapub//vegetables
- http://www.icar.org.in/dipa/events/ICARNEWS/volume-II
- http://www.hos.ufl.edu/protectedAgI
- http://ohioline.osu.edu/b672
HOR 304 Study Tour – II 0 + 1

Visit to places of commercial cultivation of flower crops, spices and plantation crops (other than coffee and tea) in Tamil Nadu – study of cropping system – varieties – adoption of scientific crop production technology – constraints in production – marketing – economic analysis.

Practical schedule

1. Visit to Agricultural Research Station, Aliyarnagar – Coconut and coconut based intercrop systems.
2. Tamil Nadu Agricultural University, Coimbatore campus.
3. Visit to Thudiyalur- arecanut area-Forest Research Station, Mettupalayam – Ence Aromatics.
4. Visit to Ooty, Coonoor and Bhavanisagar.
5. Visit to mango orchards, Regional Research Station, Paiyur-processing unit.
6. Visit to Giant Orchards, Melchengam
7. Visit to Regional Research Station, Vridhachalam – Cashew.
8. Visit to Tamil Nadu Rice Research Institute, Aduthurai.- oilpalm
9. Visit to Sugarcane Research Station, Sirugamani – Betelvine

ABT 301 APPLIED PLANT BIOTECHNOLOGY 1 + 1
Aim

❖ To impart knowledge on recent advances in the applications of plant molecular biology and biotechnology in crop improvement

Theory

Unit I Plant tissue culture and applications

Micropropagation and successful examples- meristem culture and production of virus free plants - protoplast isolation and fusion - somatic hybrids. Somaclonal variation, synthetic seeds - Doubled haploids - National certification system for TC plants- in vitro germplasm conservation

Unit II Molecular marker technology

DNA markers -different kinds -hybridization based RFLP -PCR based markers - AFLP, RAPD, SSR and SNPs - DNA fingerprinting of varieties -gene tagging - marker assisted selection and its application in crop improvement.

Unit III Transgenic technology

Transgenic plants for biotic and abiotic stress resistance and quality improvement-current status at national and international level- detection of GMOs - biosafety and bioethics

Unit IV Molecular pharming

Plants as biofactories – production of vaccines, therapeutic proteins, industrial enzymes and bioplastics

Unit V Bioprospecting

Discovery of novel compounds from plants - secondary metabolites – callus and cell suspension culture, bioreactors for plant cell culture.

Practical

Micropropagation of banana and rose. Meristem culture of cassava-virus indexing -DNA fingerprinting using RAPD and SSR markers- NTsys analysis - an example of marker assisted selection -transformation of tobacco, analysis of transgenic plants- PCR, strip assay of Bt cotton, ELISA for protein expression analysis -Callus and cell suspension culture-extraction and quantification of secondary metabolites- antimicrobial assay, visit to GC-MS, HPLC lab
Lecture schedule

1. Micropropagation of commercially viable crops – banana and ornamental plants
2. Meristem culture and production of virus free plants - disease detection and indexing- PCR, ELISA
3. Protoplast isolation and fusion- production of somatic hybrids
4. Synthetic seeds, Somaclonal variation and applications,
5. National certification system for TC plants
6. Herbicide tolerant, biotic stress resistant transgenic plants- pest and disease resistant
7. Abiotic stress resistant transgenic plants – Drought, salinity and temperature
8. Transgenic plants engineered for quality traits- enhancement of nutrition quality, shelf life
9. Mid semester examination
10. Detection of GMOs, Indian regulatory guidelines, biosafety and bioethics
11. Current status of transgenic crops at national and global level
12. DNA markers - hybridization and PCR based markers
13. DNA fingerprinting of varieties and gene tagging
15. Plants as biofactories – Production of recombinant proteins- Vaccines, therapeutic proteins, industrial enzymes and bio plastics
17. Callus and Cell suspension culture, bioreactors for plant cell cultures.
Practical schedule

1. Micropropagation of banana
2. Micropropagation of rose
3. Meristem culture of tapioca
4. Virus indexing in banana and tapioca
5. Transformation of tobacco and analysis of transgenic plants - PCR
6. Visit to Bt cotton field and strip assay for detecting Cry protein
7. ELISA for Cry protein expression analysis
8. DNA isolation
9. DNA fingerprinting using RAPD primers
10. NTsys analysis
11. Hybrid identification using SSR marker
12. Callus culture
13. Cell suspension culture
14. Extraction of secondary metabolites
15. Antimicrobial assay using food poisoning technique
16. Visit to commercial tissue culture lab / biotech lab/GC-MS, HPLC lab
17. Practical Examination

Outcome
Students are exposed to current status of the applications of molecular manipulations in crop improvement.

Text Book
Further Reading

References
- http://www.agbioworld.org
- http://www.agbiosafety.unl.edu/.
AEN 311 Pest Management in Horticultural Crops 2 + 1

Theory

Unit I Insect ecology and components of pest management

Insect Ecology- Effect of abiotic and biotic factors on insect population. Pest - definition, categories of pests, factors governing pest outbreaks. Concept of economic threshold level and economic injury level. Principles and components of pest management

Unit II Methods of pest control

Cultural, physical, mechanical and legal methods of pest control. Biological control-parasitoids, predators, viruses, bacteria, fungi and nematodes and their role in insect management. Host plant resistance - Types and mechanisms of resistance. Chemical control - Classification of pesticides, role of insecticides in pest management. Biorational pest management - Semiochemicals - pheromones, allomones, kairomones and synamones - role of pheromones in pest management. Insect growth regulators - moult inhibitors, JH mimics, insect antifeedants, repellants and botanicals in pest management. Biotechnology in pest management.

Unit III Pests of fruits, vegetables and tubers

Distribution, bionomics, symptoms of damage and management strategies of insect and non insect pests of Brinjal, Bhendi, Tomato, Crucifers, Cucurbits, Moringa, Amaranthus, Potato, Sweet potato, Tapioca, Mango, Guava, Sapota, Citrus, Banana, Grapevine, Jack, Jamun, Aonla, Pomegranate, Papaya, Ber, Apple, Pear, Peach and Plum,

Unit IV Pests of spices and plantation crops

Distribution, bionomics, symptoms of damage and management strategies of insect and non insect pests of chilli, onion, garlic, turmeric, curry leaf, coconut, arecanut, coffee, tea, cashew, rubber, cocoa, cardamom, pepper and betel vine
Unit V Pests of ornamental and medicinal plants, tree crops, lawn, turf, dry fruits and apiculture

Distribution, bionomics, symptoms of damage and management strategies of insect and non insect pests of rose, jasmine, crossandra, chrysanthemum, tuberose and gloriosa, coleus, phyllanthus, aswaganga, neem, teak, subabul, tamarind, sandalwood, eucalyptus, casurina, lawn, turf and cutflowers, dry fruits, nuts and other horticultural products. maintenance of honey bee colonies in orchards

Practical

Identification of symptoms of damage and life stages of important pests of different horticultural crops: vegetables, fruits, tubers, spices, plantation crops, ornamentals, medicinal plants lawn, turf, cut flowers, tree crops, dry fruits, nuts and other horticultural products. Establishment and maintenance of honeybee colonies

Assignment

Collection and submission of 50 pests of horticultural crops

Rearing a minimum of 20 insect pests and preparation of two riker mounts of pests of horticultural crops

Lecture schedule

1. Insect ecology –Role of biotic (food, competition, parasitoids and predators, host plants) and abiotic factors (temperature, humidity, rainfall, microclimate etc) on pest abundance.
2. Pest – definition, categories and causes of outbreak, Economic injury level (EIL) and economic threshold level (ETL). Principles of integrated pest management methods.
3. Cultural, physical, mechanical and legal methods of pest control - different components
4. Host plant resistance – types and mechanisms of resistance
5. Biological control – definition, parasitoids and predators and entomopathogens and their role in pest management.
6. Chemical control – classification of insecticides and their role in pest management
7. Semiochemicals – definition, Interspecific (allomone, kairomone and synomone),
   Intraspecific (pheromones) – Pheromones in pest management.
8. Insect growth regulators (IGRs)- moult inhibitors, JH mimics, insect antifeedants,
   repellents and botanicals in pest management
9. Biotechnological approaches in pest management
10. Pests of brinjal and bhendi
11. Pests of amaranth, tomato and moringa
12. Pests of cucurbits and crucifers
13. Pests of potato, sweetpotato and tapioca
14. Pests of mango I
15. Pests of mango II and guava
16. Pests of citrus and sapota
17. Mid semester examination
18. Pests of grapevine and banana
19. Pests of jack, pomegranate, pine apple and aonla
20. Pests of jamun, papaya and ber
21. Pests of apple, pear, peach and plum
22. Pests of coconut and arecanut
23. Pests of coffee and tea
24. Pests of cashew, rubber and cocoa
25. Pests of chillies, onion, garlic and turmeric
26. Pests of curry leaf, cardamom, pepper and betel vine
27. Pests of rose and jasmine
28. Pests of crossandra, chrysanthemum and tuberoses
29. Pests of gloriosa, coleus, phyllanthus and aswagantha
30. Pests of tamarind, casuarina, subabul and neem
31. Pests of teak, eucalyptus and sandalwood
32. Pests of dry fruits, nuts and other horticultural products
33. Pests of lawn, turf and cut flowers
34. Maintenance of honey bee colonies in orchards
Practical schedule

Identification of symptoms of damage and life stages of important

1. Pests of brinjal, bhendi and tomato
2. Pests of amaranthus, moringa, chillies, coriander and curry leaf
3. Pests of crucifers and cucurbits
4. Pests of mango, citrus and sapota
5. Pests of banana, grapevine, guava and jamun
6. Pests of Pomegranate, amla, papaya, ber and apple
7. Pests of potato, sweet potato and tapioca
8. Pests of coconut and arecanut
9. Pests of coffee and tea
10. Pests of cashew, rubber and cocoa
11. Pests of onion, turmeric and tamarind
12. Pests of cardamom, pepper and betelvine
13. Pests of rose, jasmine, crossandra, chrysanthemum and tuberose
14. Pests of gloriosa, coleus, neem, teak and subabul
15. Pests of sandalwood, eucalyptus, lawn, turf, and cut flowers
16. Pests of dry fruits, nuts and other horticultural products
17. Practical examination

Text Books

II) Research Periodicals and Book Publishing House, India.
AEC 301 Production Economics and Farm Management 1 + 1

Unit I Nature and scope

Production economics: Meaning - definition - nature and scope - Farm Management: Definition - objectives of farm management - production economics vs farm management - farm management decisions - decision making process - scope of farm management. Types and systems of farming: types - specialized and diversified-mixed systems of farming - peasant farming - state farming - capitalistic - collective-co-operative farming.

Unit II Factor product relationship


Unit III Factor factor relationship

Factor-factor relationship : Meaning- isoquant - definition and types - isoquant map - marginal rate of technical substitution - factor intensity - isocline- ridge line - returns to scale - elasticity of factor substitution- iso-cost line - principle of factor substitution and least cost combination of inputs -Expansion path - Effect of input price changes on the least cost combination.

Unit IV Product product relationship


Unit V Farm planning and budgeting

**Practical**


**Lecture schedule**

1. Production Economics : Meaning- Definition – Nature and Scope - Farm Management : Definition - Objectives of Farm Management - Production Economics Vs Farm Management
2. Farm Management Decisions - Decision making process - Scope of farm management
4. Factor-Product relationship : Meaning - Agricultural/horticultural Production Function : Meaning – Definition- Laws of returns: increasing, constant and decreasing returns
5. Classical production function and three stages of production – Elasticity of production
6. Types of Production functions- Linear, Cobb-Douglas and Quadratic
7. Cost concepts and cost curves: total, average and marginal cost concepts and curves, economics of scale.
8. Determination of optimum input and output: input approach and output approach - physical and economic optimum.
9. Mid semester examination
11. Returns to scale – elasticity of factor substitution- iso-cost line – principle of factor substitution and least cost combination of inputs – Expansion path - Effect of input price changes on the least cost combination
14. Farm planning: importance – characteristics of good farm plan – farm planning procedure
16. Linear programming: Assumptions – Linear programming model defined – graphical solution - advantages and limitations
17. Risk and uncertainty: definition – types of risk and uncertainty – safeguards against risk and uncertainty

**Practical schedule**

2. Determination of least-cost combination
3. Determination of optimum product combination
4. Computation of cost concepts- cost of cultivation and cost of production of agricultural/horticultural crops
5. Cost of cultivation and production of perennial crops/horticultural crops.
6. Cost of production of livestock products
7. Depreciation: methods of calculating depreciation
8. Visit to a farm (government/private/corporate) to study the layout and organization
9. Farm records and accounts: Usefulness, types of farm records—farm production records—farm financial records
10. Visit to a private agricultural/horticultural farm to collect information on farm business
11. Farm inventory analysis: Examination of assets—valuation of assets by different methods
12. Preparation and analysis of Net worth statement and Profit and loss statement
13. Estimation of Break-even analysis
14. Preparation of complete budget and partial budgets
15. Preparation of farm plan
16. Graphical solution to Linear programming problem
17. Final practical examination

References


PBG 301 Principles and Methods of Plant Breeding In Horticultural Crops 2 + 1

Aim
- To expose the students to basic and applied principles of plant breeding in horticultural crops.

Theory

Unit I Reproductive systems and plant breeding
- Introduction to plant breeding - objectives and role - historical perspective - centres of origin - germplasm - conservation - plant introduction - reproduction in plants - systems of mating - self incompatibility - sterility - apomixes.

Unit II Breeding methods of self pollinated crops

Unit III Breeding methods of cross pollinated crops
- Breeding methods: cross pollinated crops - genetic structure - Hardy Weinberg law - mass selection - modified mass selection; Heterosis breeding - use of male sterility systems - types of hybrids; recurrent selection - synthetics - composites; asexual breeding system: genetic structure - breeding methods

Unit IV Special breeding methods
- In vitro selection techniques; mutation breeding - polyploidy breeding and distant hybridization -- Introduction to markers - morphological - biochemical- DNA markers - Use of markers for crop improvement

Unit V Maintenance breeding
- Maintenance breeding - procedure for release of new varieties - stages in multiplication - certification - Nucleus and breeder seed production techniques - Current trends in plant breeding
Practical


Lecture schedule

1. Objectives and role of plant breeding - historical perspective – activities in Plant Breeding.
8. TGMS,PGMS, Gametocides, Transgenic Male sterility and applications.
10. Basic biometrics - nature and significance of qualitative and quantitative variation - phenotypic, genotypic and environmental heritability and genetic advance.


17. Mid semester examination

18. Backcross breeding - genetic principles - pre-requisites - procedures for transferring dominant and recessive genes.


22. Recurrent selection principles - types - merits and demerits.
27. In vitro selection techniques – somaclonal variation – utilization in crop improvement; Use of double haploids in crop improvement.
30. Wide hybridization-history-importance-barriers and techniques for overcoming barriers-utilization
33. Maintenance Breeding: General seed production techniques – steps in nucleus and breeder seed production – varietal rundown and renovation.
34. Breeding for biotic and abiotic stresses; Current trends in plant breeding - Marker assisted breeding -Transgenic crops - Varietal protection.

**Practical schedule**

1. Pollination and reproduction in plants - Alternation of generation and life cycle.
2. Description and drawing different pollination systems - Mechanisms enforcing self and cross pollination in crops.

4. Breeder kit and its components – uses; Principles of selfing and crossing techniques

5. Emasculation, and pollination techniques in horticultural crops.

6. Emasculation, and pollination techniques in horticultural crops.

7. Layout of different yield trials - Observing the experimental plots.

8. Calculation of PCV, GCV, heritability, genetic advance


10. Maintenance of A, B and R line and TGMS lines. Hybrid seed production techniques

11. Studies on segregating generations and maintenance of records.


13. Studies on different wild species in crop plants and wide hybridization.


15. Observation on germplasm preservation – evaluation - records maintained in research stations

16. Procedure for marker assisted selection

17. Practical examination

**Text books**


**Further reading**

e References
- http://en.wikipedia.org/wiki/Plant_breeding
- http://www.edugreen.teri.res.in/explore/bio/breed.htm
- http://cuke.hort.ncsu.edu/gpb/
- http://www.stumbleupon.com/tag/plant-breeding/
  http://www.iaea.org/
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<td>Breeding of Horticultural Crops</td>
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<td>2.</td>
<td>FLG 302</td>
<td>Ornamental Gardening, Landscaping and Turf Management</td>
<td>2 + 1</td>
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<td>EXP 301</td>
<td>Experiential Learning</td>
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<td>ENS 311</td>
<td>Waste Management in Horticulture Industry</td>
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<td>5.</td>
<td>NST 301</td>
<td>Fundamentals and Applications of Nanotechnology</td>
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<td>6.</td>
<td>PSM 401</td>
<td>Internship in Plantation and Hill Horticultural Crops</td>
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<td>7.</td>
<td>ENG 301</td>
<td>Soft Skills for Career Development</td>
<td>0 + 1</td>
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<td>8.</td>
<td>FSN 311</td>
<td>Principles of Processing and Value Addition of Horticultural Produces</td>
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<td>AEX 301</td>
<td>Extension Methodologies and Transfer of Agricultural Technologies</td>
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III Year VI Semester
VSC 302 Breeding of Horticultural Crops 2 + 1

Aim

- To study the basics of floral biology, pollination mechanism, breeding strategies, methods of crossing in horticultural crops.

Theory

Unit I Breeding of self and cross pollinated and asexually propagated crops

Methods of breeding and achievements in crop improvement of self and cross pollinated and asexually propagated crops

Unit II Fruit crops

Floral biology, methods of breeding and achievements in crop improvement of fruit crops: mango, banana, acid lime, mandarin orange, sweet orange, grapes, sapota, papaya, aonla, guava, pomegranate and custard apple.

Unit III Vegetable crops

Floral biology, methods of breeding and achievements in crop improvement of vegetable crops: tomato, brinjal, chilli, bhendi, bitter gourd, cucumber, watermelon, bottle gourd, peas, beans, potato, tapioca, sweet potato, onion, amaranth, moringa, carrot, cabbage and cauliflower.

Unit IV Spices and plantation crops

Floral biology, methods of breeding and achievements in crop improvement of spice crops: black pepper, cardamom, clove, nutmeg, coriander, garlic, turmeric and ginger and plantation crops: tea, coffee, cocoa, cashew, coconut, arecanut and palmyrah.

Unit V Flower crops, medicinal and aromatic crops

Floral biology, methods of breeding and achievements in crop improvement of flower crops: rose, jasmine, chrysanthemum, marigold, tuberose, crossandra, carnation and tropical orchids, medicinal crops: senna, gloriosa and coleus and aromatic crops: mint and cymbopogon.
Practical

Practical floral biology and pollination mechanism- study of wild relatives-practices in selfing and crossing procedures in the crops: mango, banana, citrus, sapota, pomegranate papaya, guava, aonla, custard apple, tomato, chilli, brinjal, bhendi, tapioca, sweet potato, peas, beans, bitter gourd, watermelon and cucumber, onion, amaranth, annual moringa, coriander, coconut and gloria- Exploitation of heterosis and techniques of F₁ hybrid production-Mutation and mutagenic treatments-Methods of induction of polyploidy- Identification of elite trees- Procedure for release of new varieties DUS testing.

Lecture schedule

1. Breeding strategies, with its of self pollinated crops merits and demerits and methods of improvement
2. Breeding strategies, merits and demerits and methods of improvement of cross pollinated crops
3. Breeding strategies, merits and demerits and methods of improvement of asexually propagated crops
4. Floral biology, breeding strategies and achievements made in crop improvement of Mango.
5. Floral biology, breeding strategies and achievements made in crop improvement of banana.
6. Floral biology, breeding strategies and achievements made in crop improvement of acid lime, sweet orange, mandarin orange.
7. Floral biology, breeding strategies and achievements made in crop improvement of grapes
8. Floral biology, breeding strategies and achievements made in crop improvement of sapota
9. Floral biology, breeding strategies and achievements made in crop improvement of papaya
10. Floral biology, breeding strategies and achievements made in crop improvement of pomegranate and aonla
11. Floral biology, breeding strategies and achievements made in crop improvement of guava and custard apple
1. Floral biology, breeding strategies and achievements made in crop improvement of tomato
2. Floral biology, breeding strategies and achievements made in crop improvement of brinjal.
3. Floral biology, breeding strategies and achievements made in crop improvement of chilli
4. Floral biology, breeding strategies and achievements made in crop improvement of bhendi.
5. Floral biology, breeding strategies and achievements made in crop improvement of onion
6. Mid semester examination
7. Floral biology, breeding strategies and achievements made in crop improvement of bitter gourd and cucumber
8. Floral biology, breeding strategies and achievements made in crop improvement of watermelon and bottle gourd
9. Floral biology, breeding strategies and achievements made in crop improvement of moringa and amaranth
10. Floral biology, breeding strategies and achievements made in crop improvement of tapioca and sweetpotato
11. Floral biology, breeding strategies and achievements made in crop improvement of peas and beans
12. Floral biology, breeding strategies and achievements made in crop improvement of potato
13. Floral biology, breeding strategies and achievements made in crop improvement of carrot, cabbage and cauliflower
14. Floral biology, breeding strategies and achievements made in crop improvement of black pepper and cardamom.
15. Floral biology, breeding strategies and achievements made in crop improvement of clove, nutmeg, coriander and garlic.
16. Floral biology, breeding strategies and achievements made in crop improvement of turmeric and ginger.
17. Floral biology, breeding strategies and achievements made in crop improvement of tea and coffee.
18. Floral biology, breeding strategies and achievements made in crop improvement of cocoa and cashew.
19. Floral biology, breeding strategies and achievements made in crop improvement of coconut, arecanut and palmyrah.
20. Floral biology, breeding strategies and achievements made in crop improvement of rose and jasmine.
22. Floral biology, breeding strategies and achievements made in crop improvement of tuberose, crossandra, carnation and tropical orchids.
23. Floral biology, breeding strategies and achievements made in crop improvement of senna, gloriosa, coleus, mint and cymbopogon.

Practical schedule

1. Study of floral biology and pollination mechanism, practices in selfing and crossing in mango and banana.
2. Study of floral biology and pollination mechanism, practices in selfing and crossing in citrus, sapota and pomegranate.
3. Study of floral biology and pollination mechanism, practices in selfing and crossing in papaya, guava and aonla.
4. Study of floral biology and pollination mechanism, practices in selfing and crossing in tomato and chillies.
5. Study of floral biology and pollination mechanism, practices in selfing and crossing in brinjal and bhendi
6. Study of floral biology and pollination mechanism, practices in selfing and crossing in tapioca and sweet potato
7. Study of floral biology and pollination mechanism, practices in selfing and crossing in peas and beans
8. Study of floral biology and pollination mechanism, practices in selfing and crossing in bitter gourd, watermelon and cucumber.
9. Study of floral biology and pollination mechanism, practices in selfing and crossing in onion, amaranth and annual moringa
10. Study of floral biology and pollination mechanism, practices in selfing and crossing in coriander, coconut and gloriosa.
11. Study of mutagenic treatments and various methods of mutation
14. Exploitation of heterosis and techniques of F₁ hybrid production in cross-pollinated crops.
15. Identification of elite or plus trees in major fruit crops.
16. Variety release, procedures involved and DUS testing.
17. Practical examination.

Text Books

Further Reading

References
- [http://www.agron.iastate.edu/faculty/fehr/BVC/00BVC.PDF](http://www.agron.iastate.edu/faculty/fehr/BVC/00BVC.PDF)

Journals
- J of cytogenetics
- Economic botany
- Acta Horticulture
FLG 302 Ornamental Gardening, Landscaping and Turf Management 2 + 1

Aim

- To educate students on ornamental gardening special type of gardens, computer aided designing of landscape (CAD) and turf management

Theory

Unit I Importance and scope

- Importance and scope of gardening – historical background - gardens in India – definition, principles and concepts of landscape gardening - styles and types of gardens - Hindu, Moghul, English, Italian, Persian and Japanese gardens - bioaesthetic planning – definition and need – ornamental landscaping in environmental protection.

Unit II Garden designs

- Garden components and adornments - importance and designing – plant components and non-plant components - rosary, topiary, trophy, rockery, pond, sunken garden, flower beds, arboretum, conservatory, roads, walks, paths, hedges, edges, carpet garden, arch, pergola, arbour, fountains, cascades, garden seats, statues, hanging baskets, trellies, ornamental vases, ornamental urns and window boxes. Special types of gardens - principles and design – dish, terrarium, water and bog garden, traffic islands - terrace garden, rockery, vertical garden and tree transplanting.

Unit III Garden plants for landscaping


Unit IV Computer Aided Design

- Landscape architecture – design, planning and management of natural and built environments. Computer aided design (CAD) – Geographical Information system (GIS) –landscape planning – home garden, public, urban and industrial gardening. Avenue planting – principles, plants suitability and planting.

Unit V Turf management
Importance and scope – turf grasses – species and types – selection of site 
-media and field preparation – types of lawn making – turf establishment for golf 
ground, cricket pitch and football field – turf management – renovation of lawns – 
astroturf and management.

**Practical**

Identification and description of annuals – shrubs – trees - herbaceous 
perennials – climbers and creepers – palms and ferns – cacti and succulents. Software 
tools in landscape architecture – landscape with CAD - Planning and designing of 
garden components – special types of gardens – avenue planting – site design creation – 
urban and rural planting - Dry flower and bonsai making - turf management - visit to 
gardens - visit to institutional, sports and games lawns and turf nurseries – renovation 
of lawns – economics.

**Lecture schedule**

**Theory**

1. History, development, scope and importance of landscape gardening
2. Definition and basic principles and of landscaping gardening
3. Principles of landscape architecture
4. Study of styles of garden
5. Study of types of garden – Hindu garden, Persian garden and Moghul garden
6. Study of types of garden – English garden, Japanese garden and Italian garden
7. Bio aesthetic planning – definition and need
8. Role of ornamental landscaping in environmental protection
9. Study of principles and designing of plant components
10. Study of principles and designing of non plant components
11. Study of special types of gardens - dish, terrarium, water garden and bog 
gardens
12. Study of special types of gardens – roof garden, rockery and traffic islands
13. Study of special types of gardens - vertical garden.
14. Principles and method of tree transplanting - Berlapping
15. Study of trees and their role in landscaping
16. Role of annuals and herbaceous perennials in landscape gardening
17. Mid Semester examination
18. Study of shrubs and their role in landscaping
19. Study of climbers and ground covers in landscaping gardening
20. Study of palms and ferns in landscaping
21. Study of cacti and succulents in landscaping gardening
22. Study of principles and methods dry flower production
23. Study of principles and methods of flower arrangement
24. Study of styles and types of bonsai making
25. Planning and designing of natural and built environments
26. Study of CAD and GIS in landscape designing
27. Study of water and bog garden
28. Designing of home gardens
29. Designing public, urban and industrial gardens
30. Study of roadside and avenue planting.
31. Importance, scope and species of lawn
32. Establishment of lawn, maintenance and rejuvenation of lawn
33. Study of golf ground and cricket pitch and management
34. Study of astroturf and management

Practical schedule

1. Identification and description of annuals shrubs and herbaceous perennials
2. Identification and description of trees, climbers and ground covers
3. Identification and description of cacti, succulents, palms, ferns and ornamental grasses.
4. Description and designing of garden components – arches, bowers, pergolas, paths, walks, bridges, fountains and statues
6. Designing and layout of rockery and terrace garden
7. Designing and layout of water garden and bog garden
8. Designing and practicing bonsai, flower arrangements and bouquet preparation
9. Dry flower technology – practice, preparation of floral crafts and cards
10. Practice of handling software tools in landscape architecture
11. Practice of landscape with CAD (Computer Aided Design)
12. Practicing landscape design and plan – home and industrial garden
13. Project preparation and estimate preparation for landscaping
14. Practicing landscape design for urban and rural locations
15. Lawn and turfs – preparation of land, planting, after care and turf economics
16. Visit to large scale gardens, dam sites, lawns and turf nurseries
17. Practical examination.

**Text Books**


**Further reading**


**References**

- [www.bestgarden.net](http://www.bestgarden.net)
- [www.indiaagronet.com](http://www.indiaagronet.com)
Journals

- J. of ornamental Hort.  Indian Society of Ornamental Horticulture, Division of Floriculture and Landscaping, Indian Agricultural Research Institute, New Delhi.
- Ind. J. of Hort.  The Horticultural Society of India, Indian Agricultural Research Institute, New Delhi.

EXP 301 Experiential Learning 0 + 5

- Pruning in high density planting (0+1)
- Rejuvenation of old orchards (0+1)
- Off season mango production (0+1)
- Pruning in grapes (0+1)
- Precision farming in Banana (0+1)
- Post harvest treatments for enhancing the shelf life of fruits (0+1)
- Nursery technology and vegetable seed production (0+1)
- F₁ hybrid vegetable seed production (0+1)
- Protected cultivation of vegetable crops (0+1)
• Precision farming in turmeric (0+1)

• Propagation techniques in coriander (0+1)

• Drip irrigation in coriander (0+1)

• Commercial seed production in loose flowers (0+1)

• Propagation techniques of commercial ornamental and medicinal crops (0+1)

• Exterior and interior flower arrangements (0+1)
ENS 311 Waste Management in Horticulture Industry 1 + 1

Aim

❖ To impart Knowledge on the process of recycling of solid wastes from horticultural industries
❖ Exposing and updating the UG students in waste management

Theory

Unit I Introduction to environment

Environmental components - environmental segments - atmosphere, hydrosphere, lithosphere and biosphere - energy fundamentals - bio nutrient cycling - biological interactions - environmental resources – air, water and soil.

Unit II Characteristics of horticulture industrial wastes

Horticultural industries - Tamil Nadu and India - liquid and solid wastes - characteristics - impacts - fruit and vegetable processing industries - case studies - mango, cocoa, sago and coffee processing industries.

Unit III Waste water management

Waste water treatment processes - aerobic and anaerobic treatment - bioreactors - biomethanation - microbial remediation - biofilters, biosorption - reed bed technologies.

Unit IV Solid wastes management

Solid wastes - sources, disposal problems and management technologies -- recycling - resource recovery - value addition - composting and vermicomposting - bioconversion - Recycling of green house cladding material - Packaging materials and recycling - land application of solid wastes and its impact on soil and crops

Unit V Environmental monitoring and regulations


**Practical**

Horticultural industry waste water characterization – solids, alkalinity, acidity, hardness, DO, BOD, COD, enumeration of aerobes and anaerobes - water borne pathogens – treatments – physical, chemical and biological, anaerobic treatment – solid waste recycling– biogas production -- bio composting – pectin extraction - visit to identified horticultural industries for assessing pollution status.

**Lecture schedule**

1. Environmental components and Environmental segments – Atmosphere, Hydrosphere, Lithosphere and Biosphere
2. Energy fundamentals - bio nutrient cycling and Biological interactions
3. Environmental resources – air, water and soil.
4. Horticultural industrial wastes- liquid and solid waste - Characteristics - impacts
5. Fruit and vegetable processing industries - case studies – coffee processing industries
6. Fruit and vegetable processing industries - case studies-Mango, Cocoa and Sago processing industries
7. Waste water treatment Processes – Aerobic and anaerobic treatment
8. Bioreactors – biomethanation – Microbial remediation – Biofilters, Biosorption
9. Mid semester examination
10. Reed bed Technologies - constructed wetlands - Engineered reed bed system
11. Solid wastes – sources, disposal problems and management technologies
12. Recycling – resource recovery – value addition – composting and vermicomposting
13. Bioconversion – recycling of green house cladding material and Packaging materials
14. Land application of solid wastes and its impact on soil and crops
15. Green Technologies - CDM - Eco labeling - Biosensors – bio indicators
16. Environmental Impact Assessment (EIA) and Environmental laws and organizations
17. EMS – Environmental education and awareness
Practical schedule

1. Sampling methods for fruit and vegetables processing industry wastes
2. Estimation of Solids, Alkalinity and acidity of fruit and vegetables processing wastewater
3. Estimation of hardness of fruit and vegetables processing wastewater
4. Estimation of dissolved oxygen and BOD of Fruit and vegetables processing wastewater
5. Estimation of Chemical oxygen demand (COD) of Fruit and vegetables processing wastewater
6. Enumeration of aerobic microorganisms from Fruit and vegetables processing wastes
7. Enumeration of anaerobic microorganisms from Fruit and vegetables processing wastes
8. Detection of waterborne pathogens in fruit processing industry wastewater
9. Visit to horticulture industry and studying its pollution status
10. Physical and chemical methods of horticultural industry wastewater treatment
11. Biological methods of horticultural industry wastewater treatment
12. Anaerobic treatment of coffee and rubber processing wastewater using bioreactors
13. Biogas production from Horticultural industry wastes
14. Visit to horticultural industry studying its pollution status
15. Management of horticultural industry solid wastes by Composing and Vermicomposting
16. Extraction of pectin from banana wastes.
17. Practical Examinations

Outcome

Create awareness among the students on pollution management & industrial hygiene and mitigation measures for management of horticulture industrial wastes.
Textbooks


Further Reading


E references

- http://umbbd.ahc.umn.edu/bsd/index.html
- http://geocities.com/hotspur311
- http://faculty.rio.edu/lindas/essyl.html
- http://www.cplbookshop.com

Journals

- Indian Journal of Environmental Quality
- Indian Journal of Environmental Health
NST 301 Fundamentals and Applications of Nanotechnology 1 + 0

Theory

Unit I Principles of nanoscience

History, definition, terminologies in nanoscience - importance of Moore’s law - introduction to nanomaterials - semiconductor - diode - Quantum Dots - Buckyball - CNT - Polymers - types - PLGA - coreshell nanoparticles - micelle - introduction to nanobiosensor - types - properties and applications

Unit II Synthesis of nanomaterials

Top-down and bottom-up approaches - physical, mechanical, chemical and biological synthesis of nanomaterials

Unit III Properties and characterization of nanomaterials

Physical, mechanical, optical, magnetic, thermal and electrical properties - characterization - SEM, TEM, AFM, FT-IR, XRD

Unit IV Application of Nanotechnology

Agriculture, food industry, energy, environment, health - social, economic and ethical issues - nanotoxicology

Lecture schedule

1. History, definition, terminology in nanoscience and importance of Moore’s law.
5. Top-down and bottom-up approaches - physical method, Physical Vapour Deposition (PVD), etching - molecular beam epitoxy - sputtering - lithography.


8. Biological synthesis using microorganisms and plants.

9. Mid semester examination.

10. Mechanical, magnetic and thermal properties of nanomaterials.

11. Optical and electrical properties of nanomaterials.


17. Social, economic and ethical issues in nanotechnology and nano-toxicology.

References


References

PSM 401 Internship in Plantation and Hill Horticultural Crops  0 + 2

Practical

Plantation training in tea at UPASI, The Nilgris and training on temperate horticultural crops at Ooty. Training in coffee and other subtropical horticultural crops at Horticultural Research Station, Thadiyankudisai or Yercaud – visit to estates, factories, auction centres and blending units. Project preparation for the establishment of estates (16 days).

Practical schedule

Tea training at UPASI, Coonoor (7 days)
6. Practice in field or jungle clearing, lay out and planting of tea and shade tree seedlings and identification of different varieties of tea
7. Practice in nursery management of tea, application of fertilizers, identification of nutrient deficiencies, foliar feeding of nutrients, mulching and weed management in tea.
8. Practice in training and pruning, rejuvenation, replanting and shade management in tea.
10. Estate management, budgeting, preparation of project for establishment of tea estates and visit to various estates in the Nilgiris located at different altitudes.
11. Hands on training on hill fruit crops at Pomological Station, Coonoor.
12. Hands on training on temperate horticultural crops at Horticultural Research Station, Ooty.

Coffee training at HRS, Thadiyankudisai/HRS, Yercaud (7 days)
1. Practice in field or jungle clearing, lay out and planting of coffee and shade trees and identification of different varieties.
2. Practice in nursery management, fertilizer application, identification of different nutrient deficiencies and weed control.
3. Practice in shade regulation, training and pruning, identification of pest and diseases and their management.
4. Practice in harvesting, processing and grading.
5. Visit to different coffee estates, curing units, auction centres, coffee boards and markets.
6. Estate management, budgeting, preparation of projects for establishment of coffee estates
7. Hands on training on other hill horticultural crops
8. Final examination.
ENG 301 Soft Skills for Career Development 0 + 1

Aim

- To impart soft skills including life skills for enabling the students to become employable
- To enable out students advanced speaking skills and writing skills
- To train our students communicate with confidence and conviction in group discussions and interviews.
- To facilitate learners learn some of the corporate skills

Practical

Unit I Overview

Soft skills and hard skills – career skills and corporate skills – lateral thinking ego styles – different types – on being a professional.

Unit II – Life Skills

1. Attitude

Psychological and Sociological definitions – types of attitude (positive and negative) and consequences – suggestions to keep a good attitude.

2. Emotional Intelligence (EI)

Introduction and Definitions – four branch model of EQ and its detailed explanation - five point scale to measure EI – suggestions to improve EI

3. Interpersonal skills

Study of character traits - discussion of formal interpersonal skills like greeting, enquiring, answering, complimenting and acknowledging.

4. Self Development/Empowerment

Self awareness and motivation – Maslow’s theory of hierarchy and needs - Self analysis through SWOC and Johari Window – Elements and seven rules of motivation – Goal setting based on principle of SMART – Strategies of self motivation – Knowledge enhancing through reading of Newspapers, magazines and journals.

Unit III Communication Skills

5. Process of communication
Objectives of communication – Types of communication – Formal Vs informal communication – LSRW components of communication – Barriers to communication

6. Listening skills

Purpose and significance of listening – Process of listening – Different types of listening - How to be a good listener – Guidelines for effective listening – Barriers to listening – Tips to overcome the barriers

7. Reading skills

Purpose and significance of Reading – Benefits of reading – Process/Types of reading – Understanding/Inferring/Note making – SQ3R technique – How to be a good reader – Barriers/Distractions to good reading – Tips to overcome the barriers

8. Speaking Skills

Purpose and significance of speaking clearly – Verbal code and visual code - Benefits of good speaking – Process/ components of good speech – Informative speaking & its types – Persuasive speaking & its types – Presentation skills – Barriers of speaking - Tips to overcome the barriers

9. Writing skills


10. Telephone skills

The right environment – Formal greetings - Telephone courtesies – Effective listening skills – Interpersonal skills – Concluding formality.
11. Mid Semester

Unit IV Employability Skills

12. Interview skills - I

Definitions of interview – two types of group interview – preliminary requirements for success – telephone interview – specially designed interviews.

13. Interview skills - II

Five stages of interview – how to answer the questions

14. Group discussion


Unit V Corporate Skills

15. Leadership qualities

Definition - basic requirements – ( responsibility - self – knowledge - knowledge of, and rapport with subordinates- knowledge of the assignment- goal setting- decision making – team work ) leadership with primates – leadership and vision.

16. Negotiation skills

Select definitions – functions of negotiation – two kinds of negotiation – phases of the process – rules – steps to improve negotiation skills.

17. Time management

Basic skills of time management – relationship between stress management and time management – time management techniques for prudent time management – tips for time management.

17. Stress management

### Practical sessions

<table>
<thead>
<tr>
<th>Session No.</th>
<th>Title</th>
<th>Activity</th>
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<tbody>
<tr>
<td>1.</td>
<td>Soft Skills- an overview</td>
<td>Brainstorming session</td>
</tr>
<tr>
<td>2.</td>
<td>Life skills/ Attitude</td>
<td>Interactive software and discussion pm [positive thinking]</td>
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<tr>
<td>3.</td>
<td>Interpersonal skills</td>
<td>Demonstration</td>
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<td>4.</td>
<td>Self Development/Empowerment role-play</td>
<td>Role-play</td>
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<tr>
<td>5.</td>
<td>Process of communication</td>
<td>Interactive software Effective Communication</td>
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<tr>
<td>6.</td>
<td>Listening and speaking</td>
<td>Audio listening and close tasks</td>
</tr>
<tr>
<td>7.</td>
<td>Reading and writing Skills</td>
<td>Reading an unfamiliar text writing simulation</td>
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<tr>
<td>8.</td>
<td>Presentation Skills.</td>
<td>Listening to a software and demonstration by students and peer group evaluation</td>
</tr>
<tr>
<td>9.</td>
<td>Professional writing strategies</td>
<td>Discussion on article scientific and conference paper by means of handouts</td>
</tr>
<tr>
<td>10.</td>
<td>Writing a rejoinder</td>
<td>Divergent simulation</td>
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<tr>
<td>11.</td>
<td>Group discussion</td>
<td>Audio listening on group discussion and structured, timed Group Discussion.</td>
</tr>
<tr>
<td>12.</td>
<td>Interview skills – I</td>
<td>Listening to software on being interviewed and preparing a resume</td>
</tr>
<tr>
<td>13.</td>
<td>Interview skills - II</td>
<td>Interview simulation by subject experts and the course teacher</td>
</tr>
<tr>
<td>14.</td>
<td>Leadership qualities</td>
<td>Brainstorming session and convergent simulations</td>
</tr>
<tr>
<td>15.</td>
<td>Negotiation skills</td>
<td>Role Play</td>
</tr>
<tr>
<td>16.</td>
<td>Stress management and time management listening</td>
<td>To a software on stress and role play</td>
</tr>
</tbody>
</table>

### Reference books

**Text books**

Further reading

e references

- www.softskills.com
- www.reportingskills.com
- www.writing-skills.com
- www.negotiation.com
- www.businessballs.com
- www.study-habits.com
- www.timethoughts.com
FSN 311 Principles of Processing and Value Addition of Horticultural Produces 2 + 1

Aim

- This course provides information on the principles and methods of processing and value addition of horticultural produces. This will also enhance the knowledge on value addition of horticultural produces.

Theory

Unit I Importance of processing and value addition

Introduction: Scenario of fruit and vegetable production and processing at national and international level - contribution of horticulture produces to human nutrition: nutritive value, nutraceutical properties - concept, principles and scope of processing and value addition of horticultural produces. Tools, equipments, lay out and other requirements of a small scale food processing unit.

Unit II Principles of processing and value addition using sugar and salt


Unit III Principles of processing and value added dehydrated and canned products


Unit IV Principles of preservation by low temperature, CA, MAP and irradiation

Preservation by low temperature: definition, principle, method, suitability - refrigeration, freezing - preparation of frozen foods - preservation by controlled atmosphere, modified atmosphere: definition, principle, method, suitability -
processing by irradiation: definition, principle, method, suitability – application of irradiation in food industry.

**Unit V Recent technologies in fruit and vegetable processing**

Minimal processing of fruits and vegetables – techniques involved. Recent trends in processing – high pressure processing and processing using pulse electric field. Utilization of fruit and vegetable waste.

**Practical**

Survey on processed foods – shelf life studies of fruits and vegetables at different temperatures and atmospheric conditions. Preparation of jam, jelly, squash, marmalade, pickles, steeping preservation, dehydrated, canned and frozen products.

**Lecture schedule**

1. Scenario of food processing
2. Nutritive value and nutraceutical properties of horticulture produces
3. Concept, principle and scope of value addition
4. Tools and equipments for a food processing unit
5. Lay out and requirements of a food processing unit
6. Principle of processing using sugar for single and blended fruit products
7. Processing of jam, jelly, marmalade
8. Processing of squash and nectar
9. Processing of Ready To Serve beverage
10. Processing of fruit bars
11. Processing of preserves and fruit candies
12. Principle of processing using salt
13. Preservation by brining and processing of pickles and sauces
14. Need, principle, method and suitability of processing by dehydration
15. Types of driers: solar, cabinet, spray drier, drum drier, fluidized bed drier
16. Processing of dehydrated fruit products
17. Mid semester examination
18. Processing of osmo dried fruit products
19. Processing of dehydrated vegetable products
20. Processing of dehydrated spice products
21. Need, principle, method and suitability of processing by concentration
22. Methods of concentration and equipments used: open kettle, flash evaporators, dehydro freezing.
23. Processing of concentrated fruit pulps
24. Principle of preservation using low temperature
25. Canning of fruits
26. Canning of vegetables
27. Spoilage in canned foods and its prevention
28. Need, principle, method and suitability of processing by Controlled Atmosphere and Modified Atmospheric Packaging
29. Need, principle, method and suitability of processing by irradiation
30. Application of irradiation in food industry
31. Need, principle and methods of minimal processing of foods
32. Need, principle, method of high pressure processing
33. Need, principle, method of application of pulse electric field
34. Utilization of industrial fruit and vegetable wastes
Practical schedule

1. Market survey of processed foods
2. Packaging and evaluation of the shelf life of fruits at different temperatures
3. Packaging and evaluation of the shelf life of vegetables at different temperatures
4. Packaging and evaluation of the shelf life of fruits and vegetables under CAP and MAP
5. Processing of jam and jelly
6. Processing of squash and RTS
7. Processing of fruit bar and candies
8. Processing of pickles and sauces
9. Steeping preservation of fruits and vegetables
10. Processing of osmo dried fruit slices
11. Processing of dehydrated vegetables
12. Processing of dehydrated spices
13. Canning of fruits
14. Canning of vegetables
15. Processing of frozen fruits and vegetables
16. Visit to fruit and vegetable processing unit
17. Practical examination

Outcome

This course will enable the students to understand the concepts and principles of food processing and value addition and give an overview of the various value addition technologies.
References


Journals

Journal of Food Science and Technology
Indian Food Industry
Indian Food Packer
Beverage and Food World.
AEX 301 Extension Methodologies and Transfer of Agricultural Technologies

Aim

1. To inculcate knowledge and skill on various extension methodologies needed for effective transfer of agricultural technologies.

Theory

Unit I Communication and programme planning


Unit II Extension teaching methods


Unit III Modern communication gadgets

Modern communication sources – internet, video and teleconferencing, Interactive Multimedia Compact Disk (IMCD), village kiosks, Kissan Call Centre (KCC), mobile phone

Unit IV Diffusion and adoption

Diffusion – meaning and elements. Adoption – meaning – adopter categories and factors influencing adoption, stages of adoption, innovation decision process and attributes of innovation consequences of adoption.
Unit V Capacity building

Capacity building of extension personnel and farmers - meaning - definition, types of training, training to farmers, farm women and rural youth, FTC and KVK.

Practical

Communication pattern in TOT organizations - ongoing agricultural and rural development/TOT programmes, ATMA and SHGs - preparation of visual aids - extension literature - news stories, feature stories - interview articles - photo journalism - activities of Directorate of ODL / Educational Media Centre - activities of Community Radio Centre - writing script for radio and television - spread and acceptance of farm technologies at village level.

Lecture schedule

1. Communication-meaning, definition, functions, elements and their characteristics.
2. Types and barriers of communication and models of communication.
3. Programme planning-definition, scope, principles, importance, steps, evaluation, keys for evaluation.
4. Extension teaching methods-definition, meaning, functions, selection and classification.
5. Individual contact methods-farm and home visit, office call, telephone call and personal letter-observation and result demonstration.
6. Group contact methods-method demonstration, meeting, lecture, debate, workshop, seminar, forum and conference
7. Group contact methods-symposium, panel, brainstorming, buzz session, role playing and simulation games.
8. Mass contact methods-campaign, exhibition, farmers day and field trips - purpose, procedures, advantages and limitations.
9. Mid semester examination.
11. Audio visual aids-definition, scope and importance, classification-merits and demerits-factors influencing planning and selection.


13. Modern communication sources (e-extension)-multimedia devices-mobile phone, Kisan Call Centre, Village Knowledge Centre/information kiosks, portal, websites.

14. Diffusion-meaning, definition, elements. Innovation-adoption, meaning, definition, attributes of innovation and stages of adoption

15. Innovation-decision process, functions, adopter categories-factors influencing adoption-impact and constraints in technology transfer programmes.

16. Capacity building of extension personnel and farmers-meaning, definition and importance

17. Training-types, institutions training for farmers, farm women and rural youths and importance (FTC and KVK)

**Practical schedule**

1. Understanding the communication pattern in State Department of Agriculture/Horticulture.

2. Study on communication pattern in University TOT Centres.

3. Study of on going agricultural development programmes.

4. Preparation and practicing of posters, charts, graphs, circular letter, folders and leaflets

5. Visit to the State Department of Agricultural Engineering to study the transfer of technology efforts in farm mechanization.

6. Visit to village and fixing the priorities and selecting a most important problem for preparation of a project.

7. Visit to ATMA implemented village.

8. Studying the role of print media communication in publishing the activities of agriculture and allied fields.

9. Visit to Educational Media Centre.

10. Practicing skill on photo journalism
11. Studying the distance learning efforts of Directorate of ODL/Educational Media Centre
12. Studying the role of Community Radio Centre in TOT
13. Script writing for Radio and Television
14. Preparation of interview schedule to study the spread and acceptance of farm technologies at village level.
15. Data collection and tabulation
16. Presentation of reports.
17. Final practical examination

Outcome
The course will be of immense help to the students to acquire first hand knowledge on various extension methodologies in the area of transfer of technologies in agriculture and allied sciences.

Text Books

Journals
1. Indian Journal of Social Sciences, Serials Publications, New Delhi
2. Agricultural Extension Review, Department of Agriculture and Co-operation, Ministry of Agriculture, New Delhi
3. Journal of Rural Development, NIRD, Rajendra Nagar, Hyderabad
4. MANAGE, NAARM, Hyderabad
5. Yojana, Ministry of Rural Development, New Delhi

References
www.i4d.com
www.panasia.org
www.joe.org
AEC 302  Agricultural Marketing, Trade and Prices 1 + 1

Theory

Unit I Agricultural/horticultural marketing – nature and scope


Unit II Marketing functions and SCP paradigm

Marketing functions: buying and selling- packaging and transportation --grading and standardization--storage and warehousing -- processing and value addition. Market structure--conduct--performance paradigm (SCP) – market structure meaning, components, dynamics of conduct and performance.

Unit III Marketing efficiency and marketing institutions


Unit IV Trade in agricultural/horticultural products

policy of India – advantages of AEZs. - export promotion organization: APEDA, MPEDA, NHB, commodity boards.

Unit V Agricultural/horticultural prices and risk analysis


Practical

Farm survey-Preparation of survey schedules- farmers' marketing practices-regulated market and its role in marketing of farm produce- Cooperative marketing society -- Farmers' market- estimation of marketed and marketable surplus- Identification of marketing channels- price spread estimation for agricultural/horticultural / livestock products-Role of Food Corporation of India (FCI)/Civil Supplies Corporation in Marketing of Agricultural/horticultural Produce-Central Warehousing Corporation (CWC) / State Warehousing Corporation (SWC) and their role in storage of farm produce – Functions of NAFED and TANFED - Agmark laboratory/grading institutions-commodity boards-export oriented units- analyzing the implications of trade liberalization-time series analysis of prices - trend and seasonal variations, cyclical and irregular variations -index numbers.

Lecture schedule


4. Marketing functions - buying and selling - packaging and transportation -- grading and standardization -- storage and warehousing -- processing and value addition

5. Market SCP paradigm. Market Structure, Conduct & Performance - definitions - components and their dynamics


8. Factor market - marketing of various agricultural/horticultural inputs - channel of distribution - Input market promotional activities by firm.

9. Mid semester examination


commodities in total trade. Major exports and imports of agricultural/horticultural and Agri-allied commodities.


15. New EXIM policy of India - Role of Agri. Export Zones – Export promotion Councils – APEDA, MPEDA and ITPO.


**Practical schedule**

1. Farm Survey-Preparation of survey schedules for collection of data.
2. Farm visit to collect information on marketing practices of agricultural/horticultural commodities and marketing problems.
3. Visit to weekly shandy/vegetable market/ farmers market.
4. Regulated market and its role in marketing of farm produce – field visit.
5. A visit to Cooperative marketing society to study the services and marketing of farm produce.
7. Estimation of marketable and marketed surplus
8. Price spread estimation for major agricultural/horticultural and agri-allied products
9. Estimation of marketing efficiency and market integration
10. Visit to FCI / CSC
11. CWC/ SWC and their role in storage of farm produce.
12. Agmark Laboratory/Grading institutions-visit.
13. Marketing of farm inputs - visit to farm input dealer.
14. Visit to commodity boards/ AEZ/Export oriented Units.
15. Time series analysis of prices - TCSI variations.
16. Index number-construction and uses.
17. Practical Examination.

References

## IV Year VII Semester

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Number</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>1.</td>
<td>HOR 401</td>
<td>Rural Horticultural Work Experience - RHWE (60+10+10+10 days)</td>
<td>0 + 6</td>
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<tr>
<td>2.</td>
<td>HOR 402</td>
<td>All India Study Tour (15 days)</td>
<td>0 + 1</td>
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<td>3.</td>
<td>HOR 403</td>
<td>Project Work</td>
<td>0 + 4</td>
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<td><strong>Total</strong></td>
<td><strong>0+11=11</strong></td>
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</table>
HOR 401 Rural Horticulture Work Experience 0 + 6

The students in groups (4 to 5) shall be placed under different horticultural industries across the country for practical exposure for setting up an industry, working of the industry, technology in adoption, marketing of the products and its logistic management. The different horticulture industries include

- Processing of fruits and vegetables
- Processing of spices and condiments
- Processing of medicinal plants
- Landscaping and turfing
- Marketing and logistic management
- Dry flower Industry
- Green house production of cut flowers and vegetables
- Tissue culture

In addition, the students in groups shall be placed in different districts, in particular villages to study and explore the potentialities of horticulture crops as Village Stay Programme. The students shall survey the village, collect general information on the village, infrastructure, cropping pattern, technology adoption, awareness on recent scientific advancements, social culture etc. They shall interview the individual farmers (marginal and big farmers) on different aspects and conclude with a report on the status of the village for exploring the horticulture potentialities.

The students shall be attached with concerned Assistant Director of Horticulture at different districts of Tamil Nadu to study the organizational set up of Department of Horticulture and the schemes in operation, subsidy provision to farmers on different inputs, other activities etc.

The students shall also be attached with major Non-Government Organizations (NGO) in different districts of Tamil Nadu to study the organizational set up, role of NGO in upliftment of farmers, the schemes offered by NGO other activities etc.
HOR 402  All India Study Tour  0 + 1

The students will visit various national and international institutions related to agriculture, horticulture, forestry and other allied fields in various regions of the country. During the tour programme, the students will gain first-hand information on different agro-climatic zones, crops grown, cultivation practices, socio-cultural and economic status of the farming communities. The duration of the tour will be 16 days. The students will be evaluated as indicated below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Attendance</td>
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<tr>
<td>Behaviour</td>
<td>15</td>
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<tr>
<td>Tour diary</td>
<td>15</td>
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<tr>
<td>Tour record</td>
<td>15</td>
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<tr>
<td>Written test</td>
<td>30</td>
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<tr>
<td>Viva voce</td>
<td>15</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Practical schedule

The following institutes may be visited based on the requirement.

1. Visit to CRIDA, Hyderabad, AP.
2. Visit to IIHR and Gardens, Bangalore.
3. Visit to seed production units, Bangalore.
4. Visit to Jain irrigation and banana hi-tech field at Jalgaon, Maharashtra
5. Visit to NRC for Grapes, Pune and near by pomegranate orchards.
6. Visit to NRC for Onion and Garlic, Nasik.
7. Visit to Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan
8. Visit to CPRI, Shimla and Mushroom Research Institute, Shimla.
9. Visit to PAU, Ludhiana
10. Visit to Rose Garden and Rock Garden, Chandigarh
11. Visit to Moghul Gardens at Taj Mahal, Agra
12. Visit to Forest College, Dehradun
13. Visit to Remote sensing unit, Dehradun
HOR 403 Project Work 0 + 4

Practical

A group of 5 to 8 students will work on a specified topic suggested by the course teachers on various aspects of agri-horti business, rural farming, small and cottage industry and cooperative firms. A project report will be prepared and submitted by the students group.

Programme

Identification of thrust area - attachment of students group with the agri-horti business units, small and cooperative firms - details on establishment - type of ownership - private limited - public limited - cooperative society - functions - employment generation - raw materials - availability - end user industries - quality evaluation - standard of operation - total quality management.

Evaluation pattern

Selection of topic : 10
Basic data collection for the project work: 10
Time management for project work : 5
Project report : 75
### IV Year VIII Semester

<table>
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<th>Sl. No</th>
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<th>Course Title</th>
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<tr>
<td>1.</td>
<td>FSC 401</td>
<td>Post Harvest Handling of Horticultural Produces</td>
<td>2 + 1</td>
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<tr>
<td>2.</td>
<td>EXP 401</td>
<td>Experiential Learning</td>
<td>0 + 5</td>
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<td>3.</td>
<td>HNM 311</td>
<td>Nematode Management in Horticultural Crops</td>
<td>1 + 1</td>
</tr>
<tr>
<td>4.</td>
<td>PAT 411</td>
<td>Diseases of Horticultural Crops and their Management</td>
<td>2 + 1</td>
</tr>
<tr>
<td>5.</td>
<td>TAM 401 / ENG 401</td>
<td>Development education (or)</td>
<td>0 + 1</td>
</tr>
<tr>
<td>6.</td>
<td>SAC 401</td>
<td>Nutrient Management and Fertilizer Technology</td>
<td>2 + 1</td>
</tr>
<tr>
<td>7.</td>
<td>AEC 401</td>
<td>Agricultural Finance, Banking and Cooperation</td>
<td>1 + 1</td>
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<td><strong>Total</strong></td>
<td><strong>8 + 11 = 19</strong></td>
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FSC 401 Post Harvest Handling of Horticultural Produces 2 + 1

Aim

2. To teach the students on the principles of postharvest technology, postharvest physiology and postharvest handling techniques in horticultural crops.

Theory

Unit 1 Principles of postharvest technology

Importance and scope of postharvest technology in horticultural crops – structure of horticultural produce – pre-harvest factors influencing postharvest life – pre-harvest treatments to enhance the shelf life. Maturity indices - harvesting methods – mechanical harvesting.

Unit II Cooling, packing and packinghouse operations


Unit III Packaging and storage

Unit IV Waxing, transport, postharvest disorders, pest and disease management

Waxing-types of waxes-modes of transportation - constraints-transit hazards-postharvest disorders, pest and disease management in major horticultural crops.

Unit V Export

WTO guidelines for export of horticultural produces – CODEX standards and export standards for major fruits, vegetables and cut flowers - food safety practices - HACCP - minimal processing of fruits and vegetables - physiology - constraints and thrust areas.

Practical


Lecture schedule

1. Importance of postharvest technology for fruits.
2. Importance of postharvest technology for vegetables, spices, plantation crops and cut flowers.
3. Maturity indices for fruits crops
4. Maturity indices for vegetables crops
5. Harvesting, handling and grading of fruits.
11. Physical, physiological and biochemical changes during ripening and storage of fruits.
12. Physical, physiological and biochemical changes during ripening and storage of vegetables.
14. Physiological changes in spices and plantation crops during storage.
15. Physiological changes in cut flowers during storage.
16. Hastening and delaying ripening.
17. Mid semester examination
18. Pre harvest and postharvest treatments and shelf life of horticultural crops.
19. Waxing - effect of wax coating on shelf life of produce
20. Types of packaging materials.
21. Types of cushioning materials.
22. Preparation for market, pre–cooling, cooling, storage.
23. Packaging technology for export by air, road and sea for fruits.
24. Packaging technology for export by air, road and sea for vegetables.
25. Packaging technology for export by air, road and sea for plantation crops and spices.
26. Packaging technology for export by air, road and sea for cut flowers.
27. Methods of storage of horticultural produce.
28. Methods of storage – small scale and large scale storage.
29. Methods of storage for local and distant markets.
30. Postharvest pests, diseases and disorders, constraints in postharvest management and thrust areas - fruit and vegetables.
31. Postharvest pests, diseases and disorders, constraints in postharvest management and thrust areas - flowers
32. Postharvest pests, diseases and disorders, constraints in postharvest management and thrust areas - spices and plantation crops
33. WTO guidelines for export of horticultural produce - export standards for major fruits and vegetables - food safety practices
34. Minimal processing of fruits and vegetables - constraints and thrust areas.
Practical

1. Assessment of maturity indices and methods of harvest
2. Pre-harvest treatments to enhance the postharvest life
3. Assessment of physical, physiological and biochemical changes during ripening
4. Determination of physiological loss in weight and quality
5. Sorting, grading and washing of horticultural produce
6. Postharvest treatments enhance the postharvest life
7. Packaging of fruits, vegetables, cut flowers, dry flowers and medicinal plants using different packing materials
8. Packaging of cut flowers and dry flowers using different packing materials
9. Vase life of cut flowers
10. Packaging of medicinal and aromatic plants using different packing materials
11. Waxing
12. Methods of storage
13. Drying technology of medicinal plants
15. Identification of storage pest and diseases.
16. Visit to cold storage, processing units and markets.
17. Practical examination.

Outcome

The students will acquire the knowledge on postharvest physiology and handling techniques of horticultural produce for export.

Text books


Further reading

References

http://postharvest.ucdavis.edu/Produce/ProduceFacts/Fruit/mango.shtml
http://www.horticultureworld.net/hort-india
http://www.india.exports.com
http://www.sus-veg-thai.de/
http://www.iari.res.in

Journals

1. Punjab Hort. J.
2. Indian Food Packer
3. J. of vegetable crop production
6. Floriculture today
1. Pruning in high density planting (0+1)
2. Rejuvenation of old orchards (0+1)
3. Off season mango production (0+1)
4. Pruning in grapes (0+1)
5. Precision farming in Banana (0+1)
6. Post harvest treatments for enhancing the shelf life of fruits (0+1)
7. Nursery technology and vegetable seed production (0+1)
8. F₁ hybrid vegetable seed production (0+1)
9. Protected cultivation of vegetable crops (0+1)
10. Precision farming in turmeric (0+1)
11. Propagation techniques in coriander (0+1)
12. Drip irrigation in coriander (0+1)
13. Commercial seed production in loose flowers (0+1)
14. Propagation techniques of commercial ornamental and medicinal crops (0+1)
15. Exterior and interior flower arrangements (0+1)
HNM 201 Nematode Management in Horticultural Crops 1 + 1

Theory

Unit I Introduction and economic importance

Introduction to nematology – economic importance of nematodes - beneficial nematodes

Unit II Morphology, anatomy and taxonomy


Unit III Lifecycle, symptom and interaction

Life cycle of important nematodes – *Meloidogyne, Globodera, Rotylenchulus Tylencehulus, Radopholus* and *Pratylenchus*. Symptoms of nematode damage - interaction of nematodes with other microorganisms.

Unit IV Nematode management

Principles of nematode management - legislative (plant quarantine); physical methods (soil solarisation, hot water treatment, seed cleaning); cultural methods (deep ploughing, fallowing, crop rotation, antinemic plants, other land management practices); host plant resistance to nematodes; Improved techniques for nematode resistance breeding; biological control (nematode trapping fungi, egg parasitic fungi, obligate parasites, PGPR bacteria and predators); chemical control. Integrated nematode management.

Unit V Nematode diseases of crops

Nematode diseases of fruits (banana, citrus, grapevine, papaya) - vegetables (tomato, brinjal, bhendi, chilli, potato) - spices (turmeric, pepper, cardamom) flowers (crossandra, rose, jasmine, tuberose) plantation crops (tea, coffee, betelvine) - mushroom, medicinal and aromatic plants and nematode problem in protected cultivation.
Practical

Sampling techniques for nematode assay. Processing of soil samples for extraction of active nematodes - Extraction of nematodes by centrifugal floatation method and separation of cyst nematodes - Extraction of nematodes from plant samples. Staining techniques, direct examination of nematodes and warring blender technique. Killing, fixing, preservation and counting of nematodes - Processing and mounting of nematodes. Observation of morphological characters of Tylenchida (Hoplolaimus) and Dorylaimida (Xiphinema) - Identification of nematodes Holicotylenchus and Tylenchorhynchus - Pratylenchus Longidorus, Xiphinema - Hemicriconemoides, Aphelenchoides, Tylenchulus. Study of life stages of Meloidogyne, Globodera - Rotylenchulus and Radopholus.

Nematode disease symptoms in fruits, vegetables, spices, flower crops and medicinal and aromatic plants. Nematicides, biocontrol agents, application methods and calculation of dosages.

Lecture schedule

1. Introduction to nematology
2. Economic importance of nematodes
3. Beneficial nematodes – predatory, entomopathogenic nematodes etc.
4. Morphology and anatomy of nematodes – digestive and excretory system of nematodes.
5. Morphology and anatomy of nematodes (Contd.) – nervous and reproductive system of nematodes.
6. Taxonomy of nematodes up to super family and classification of nematodes based on parasitism.
8. Life cycle of important nematodes – Meloidogyne, Globodera, Rotylenchulus Tylenchulus, Radopholus and Pratylenchus.
9. Mid semester examination.
10. Symptoms of nematode damage.
11. Interaction of nematodes with other microorganisms.
12. Principles and methods of nematode management and IPM.
13. Nematode diseases of fruit crops (Banana, Citrus, Grapevine, Papaya)
15. Nematode diseases of spices (turmeric, pepper, cardamom) flower (crossandra, jasmine, tuberose) and plantation crops (tea, coffee, betelvine)
17. Improved techniques for nematode resistance breeding.

**Practical schedule**

1. Sampling techniques for nematode assay.
2. Processing of soil samples for extraction of active nematodes by cobb’s method
3. Extraction of nematodes by centrifugal floatation and extraction of cyst nematodes.
4. Extraction of nematodes from plant samples.
5. Staining techniques, direct examination and Blender technique.
6. Killing, fixing, preservation and counting of nematodes.
7. Processing and mounting of nematodes.
8. Observation of morphological characters of Tylenchida (*Hoplolaimus*) and Dorylaimida (*Xiphinema*)
9. Identification of nematodes *Helicotylenchus, Tylenchorhynchus, Hoplolaimus*.
10. Identification of nematodes *Pratylenchus, Longidorus, Xiphinema*.
11. Identification of nematodes *Hemicriconemoides / Hemicycliophora* and *Tylenchulus* and *Aphelenchoides*.
12. Study of life stages of *Meloidogyne* and *Globodera*
13. Study of life stages of *Rotylenchulus* and *Radopholus*
15. Nematode disease symptoms in vegetables, spices, flower crops and medicinal plants.
17. Practical examination.

Text books

Further reading

Journals
I. Indian Journal of Nematology
II. Journal of Nematology

e References
ucdnema.ucdavis.edu/imagemap/nemmap/Ent156htm/nem110.syllabus.htm
PAT 401 Diseases of Horticultural Crops and Their Management 2 + 1

Theory

Unit I  Fruit crops

Etiology, symptoms, mode of spread, survival and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma, phanerogamic parasites and non-parasitic causes of the following crops- mango, banana, citrus, grapes, guava, sapota, pomegranate, annona, papaya, jack, pineapple, ber, aonla, apple, pear, peach and plum.

Unit II  Vegetable crops

Brinjal, tomato, bhendi, cucurbits, crucifers, beans, peas, potato, sweetpotato, beetroot, radish, yam, colocasia and cassava.

Unit III  Spices and condiments

Onion, garlic, chilli, cardamom, pepper, betelvine, turmeric, ginger, fenugreek, coriander, clove, nutmeg and cinnamon

Unit IV  Plantation crops

Tea, coffee, cocoa, rubber, coconut, arecanut and vanilla.

Unit V  Flower crops, medicinal plants and mushroom cultivation

Jasmine, rose, crossandra, chrysanthemum, tuberose, carnation, lillium and marigold gloriosa, stevia and coleus, aloe. cultivation of Pleurotus, milky mushroom, Agaricus and Volvariella

Practical

Study of symptoms and host parasite relationship of the following crops: Mango, banana, citrus, grapes, guava, sapota, pomegranate, annona, jack, papaya, pineapple, ber, aonla, apple, pear, plum, peach, tomato, brinjal, cucurbits, crucifers, beans, peas, potato, cassava, sweet potato, yam and colocasia, onion, garlic, chilli, pepper, betel vine, turmeric, ginger, cardamom, fenugreek, coriander, clove, nutmeg, and cinnamon, tea, coffee, rubber, coconut, arecanut, vanilla, rose, jasmine, crossandra, chrysanthemum, tuberose, marigold, lillium, carnation, gloriosa, stevia, coleus and aloe.
Postharvest diseases of fruits and vegetables - mushroom cultivation: *Pleurotus* and *Calocybe* - field visit.

Students should submit 50 well-pressed diseased specimens.

**Lecture schedule**

Etiology, symptoms, mode of spread, survival, epidemiology and management of diseases of

1. Mango
2. Banana
3. Citrus and grapes
4. Guava, sapota, pomegranate, annona and jack.
5. Papaya, pineapple, ber and aonla.
6. Apple, pear, plum and peach.
7. Post harvest diseases - apple, mango, banana, citrus, grapes and papaya
8. Brinjal and bhendi
9. Tomato
10. Cucurbits
11. Cabbage, cauliflower, radish and beetroot
12. Potato, sweet potato, and cassava
13. Yam, colocasia, beans and peas
14. Onion and garlic.
15. Postharvest diseases - tomato, potato, carrot, and onion
16. Chilli
17. Mid semester examination
18. Pepper and betelvine
19. Fenugreek, cinnamon, nutmeg, clove and coriander
20. Turmeric and ginger.
21. Tea
22. Coffee.
23. Coconut and areca nut
24. Rubber
25. Cocoa, vanilla and cardamom
27. Crossandra and chrysanthemum.
28. Marigold, carnation, lilium and tuberose
29. Medicinal plants – Gloriosa and Stevia
30. Coleus and Aloe
31. Mushroom cultivation: Agaricus
32. Mushroom cultivation: Pleurotus and Calocybe
33. Mushroom cultivation: Volvariella
34. Biotic and abiotic stresses of mushroom

Practical schedule

Study of symptoms and host parasite relationship of
- Diseases of mango and banana.
- Diseases of citrus and grapes.
- Diseases of guava, sapota, pomegranate, annona, jack, papaya, pineapple, ber and aonla.
- Diseases of apple, pear, plum and peach.
- Diseases of tomato and brinjal.
- Diseases of cucurbits and crucifers.
- Diseases of beans, peas and potato.
- Diseases of cassava, sweetpotato, yam and colocasia.
- Diseases of onion, garlic, chilli, pepper and betelvine
- Diseases of turmeric, ginger, cardamom, fenugreek, coriander, clove, nutmeg, and cinnamon
- Diseases of tea, coffee and rubber.
- Diseases of coconut, arecanut and vanilla.
- Diseases of rose, jasmine, crossandra and chrysanthemum, tuberose, marigold, lilium and carnation
Diseases of gloriosa, stevia, coleus and aloe.

Mushroom cultivation: *Pleurotus* and *Calocybe*

Field visit

Practical examination.

Note: Students should submit 50 well-pressed diseased specimens.

**Reference books**

- Rangaswamy C. 2005, Diseases of crop plants in India -. Prentice Hall of India, Pvt. Limited, New Delhi

**Further reading**


References

www.ucmp.berkeley.edu/fungi
www.ictv.org
www.vivo.library.cornell.edu
www.plantdisease.org
ENG 401 Development Education 0 + 1  
(Equivalent course for non-Tamil students)

Practical

Basic principles of learning- taxonomy of educational objectives- transferable skills - multiple intelligence-career development-success story of entrepreneurs-group learning-brainstorming, simulation, role play, ice breakers- transactional communication- types of ego- interpersonal communication- writing- fax and e-mail, applying for a job, interviews, project report- strategies and skills- basic principles of scientific article editing.

Practical schedule

2. Bloom’s classification of educational objectives – Cognitive, Affective, Psychomotor domain(s) – discussion
3. Career development – opportunity for graduates of agriculture and allied sciences – discussion
5. Brainstorming – Demonstration
6. Simulation – Convergent task – demonstration
7. Simulation – Divergent task – demonstration
8. Role – pay – interpersonal communication – Fax, email – Transactional communication – ice breaker
9. Mid semester examination
10. Verbal and analytical skills – interactive CD-ROM
11. Writing and Editing – demonstration
12. Writing popular articles
13. Project Report – discussion on a mutilated cloze text
14. Project Report – Role play
15. Scientific articles – Selection, organization and presentation – a discussion
16. Writing a scientific article
17. Practical Examination

References


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www.mindtools.com
www.nwlink.com
www.evancarmichael.com
www.richland.edu
www.aaps-journal.org
SAC 401 Nutrient Management And Fertilizer Technology 2 + 1

Aim

This course is designed to understand about essential nutrients, soil fertility, nutrients transformations in soil, manures, fertilizers and management of sustained soil fertility. It also aims to acquire skill by the students in assessing soil fertility and its management through various approaches.

Theory

Unit I


Unit II

Nutrients - sources, forms, mobility, transformations, fixation, losses and availability of nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, manganese, zinc, copper, boron and molybdenum in soils.

Unit III


Unit IV

Methods of fertilizer application - fertigation - fertilizer solubility, interaction between irrigation water and fertilizers, fertigation scheduling. Comparison of fertilizer application methods.

Unit V

Practical


Lecture schedule

1. Soil fertility and productivity – essential nutrients- criteria of essentiality – N, P and K nutrients -functions, deficiency and toxicity symptoms
2. Calcium, Magnesium, Sulphur and Micro nutrients – functions, deficiency and toxicity symptoms
3. Concepts and approaches of soil fertility evaluation – Liebig’s Law, Mitscherlich’s law and Bray’s nutrient mobility concept. Approaches- Deficiency symptoms, tissue analysis, biological tests and chemical tests.
5. Sources, forms, mobility, transformation, fixation, losses and availability of nitrogen in soil
6. Sources, forms, mobility, transformation, fixation, losses and availability of phosphorous in soil
7. Sources, forms, mobility, transformation, fixation, losses and availability of potassium in soil
8. Sources, forms, mobility, transformation, fixation, losses and availability of calcium and magnesium in soil
9. Sources, forms, mobility, transformation, fixation, losses and availability of sulphur in soil
10. Sources, forms, mobility, transformation, fixation, losses and availability of micro nutrients in soil
11. Fertilizers- definition, classification of N,P and K fertilizers
15. Manufacturing of SSP and DAP.
17. Mid Semester Examination
18. Manufacture of MOP and SOP.
20. Mixed fertilizer – definition, preparation and compatibility
21. Micro nutrient mixtures – Preparation and characteristics
22. Fertilizer Control Order
23. Organic manures- Definition, classification and sources
24. Composting techniques- Aerobic and anaerobic (Bangalore & Coimbatore method) enriched FYM and vermicompost. Composting of organic waste- Sugarcane trash and coir waste
25. Methods of fertilizer application for different soil types - Fertigation – Definition – Soluble fertilizers – Fertilizer solubility
26. Interaction between water and fertilizer
27. Types of fertigation- Fertilizer schedule.
28. Comparison of fertilizer application methods.
29. Nutrient management concepts – INM, STCR, IPNS, SSNM and RTNM.
32. Soil health - Definition - Soil Quality Indices - Physical, chemical and Biological indicators
33. SOM maintenance - Role of SOM in sustaining soil health
34. Long term effect of fertilization on soil

**Practical schedule**

1. Soil nutrient analysis – Available N status in soil
2. Soil nutrient analysis – Available P status in soil
3. Soil nutrient analysis – Available K and S status in soil
4. Soil nutrient analysis – DTPA extractable micronutrients in soil
5. Fertilizer sampling technique.
6. Fertilizer nutrient analysis – Estimation of N in Urea
7. Fertilizer nutrient analysis – Estimation of ammoniacal and nitrate N in ammonium nitrate
8. Fertilizer nutrient analysis – Estimation of water soluble P in SSP
14. Colloquium on soil testing laboratories - Soil test based fertilizer prescription
15. Visit to STL and FTL
16. Visit to fertilizer manufacturing / mixing unit
17. Practical Examination.

**Outcome**

The knowledge gained by students through this course will be useful in making decisions on nutrient dose, choice of fertilizers and method of application etc. practiced in crop production. The skill acquired from this course can be practiced for assessing soil fertility. The students will also gain confidence in managing soil health for sustained productivity.

**References**
References

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goliath.ecnext.com/.../Deficiencies-in-the-soil-quality.html –
AEC 401 Agricultural Finance, Banking And Cooperation 1 + 1

Theory

Unit I Agricultural/horticultural finance – nature and scope

Agricultural/horticultural finance - importance – nature and scope - definition. Agricultural/horticultural credit – meaning, definition, need, classification. Sources of credit – Role of institutional and non-institutional agencies - advantages and disadvantages. Rural indebtedness. History and development of rural credit in India.

Unit II Financial institutions


Unit III Cooperation

Cooperation – philosophy and principles. History of Indian cooperative credit movement – pre and post independence periods. Cooperation in different plan periods. cooperative credit institutions – structure - short term and long term credit - functions. Strength and weakness of cooperative credit system. Policies for revitalizing cooperative credit - salient features of Vaithiyanathan Committee on revival of rural cooperative credit institutions. Reorganization of cooperative credit structure in Andhra Pradesh and single window system. Successful cooperative credit systems in Gujarat, Maharashtra, Punjab, etc. Special cooperatives – LAMPS, FSS – objectives, role and functions.
Unit IV Banking and insurance


Unit V Farm financial analysis


Practical

Visit to farm - estimation of credit needs, identification of problems and suggestions in the use of farm credit. Visit to a primary agricultural/horticultural cooperative credit society and DCCB to study their functions. Visit to a commercial bank branch to study its functions. Visit to lead bank to study the preparation and implementation of credit plans. Visit to NABARD to study its role and functions. Time value of money - compounding and discounting. Project preparation and appraisal - undiscounted and discounted methods. Visit to SHGs. Study of crop insurance products. Banking procedure for availing loan. Repayment plans.
Lecture schedule


2. Source of credit – Institutional and Non- institutional agencies – types, roles, advantages and disadvantages. Rural indebtedness. History and development of rural credit in India.

3. Institutional agencies - Commercial banks- nationalization of commercial banks – their role in rural credit. AD Branches – Area approach. Priority sector lending, Regional rural banks.

4. Role and functions of Lead bank – preparation of district credit plan. Kisan Credit Card Scheme. DIR Scheme – Relief Measures and Loan waiver Scheme. Rural credit policies.

5. Higher financial institutions - RBI, NABARD, AFC, ADB, World Bank, Insurance and Credit Guarantee Corporation of India – role and its functions in rural credit.


8. Co-operative credit institutions – structure - short term and long term credit – its functions - Strength and weakness of co-operative credit system.

9. Mid semester examination

10. Policies for revitalizing co-operative credit - salient features of Vaidyanathan Committee on revival of rural co-operative credit institutions. Special Co-operative Institutions – LAMPS, FSS - objectives, role and functions.
11. Reorganization of Co-operative credit structure in Andhra Pradesh and single window system. Successful co-operative credit systems in Gujarat, Maharastra, Punjab, etc.


15. Principles of Credit - 5C's, 3R's and 7 P's of credit. Project Management - feasibility report preparation


Practical schedule

1. Visit to a farm to study the credit needs, problems and suggestions in the use of farm credit.

2. Visit to Primary Agricultural/horticultural Co-operative Bank (PACB) to study its role, functions and procedures for availing loan

3. Visit to District Central Co-operative Bank (DCCB) to study its role, functions and procedures for availing loan – Fixation of Scale of Finance

4. Visit to land development Bank to study long term credit.

5. Visit to a Commercial Bank Branch to study its role, functions and procedures for availing loan and lead bank to study the District Credit Plan, Primary Co operative Bank for Agricultural and Rural Development.

6. Visit to NABARD to study Potential Linked Credit Plan.

7. Project preparation and appraisal – undiscounted methods

8. Project preparation and appraisal – discounted methods

9. Evaluation of farm credit proposals

10. Exercise on preparation of Repayment plans

11. Visit to Self-Help Group to study its characteristics, roles and functions

12. Analysis of Different Crop Insurance Products / visit to crop insurance implementing agency.

13. Visit to RRB to study its role, functions & procedures for availing loans.

14. Preparation of Balance Sheet and Income Statement

15. Preparation of Cash flow Statement

16. Financial Ratio Analysis

17. Practical Examination

References


### B.Sc. (Hort) - Experiential Learning Courses

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<tr>
<th>Sl. No.</th>
<th>Title</th>
<th>Credit</th>
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<tr>
<td>1</td>
<td>Genetic Manipulation and Breeding of Horticultural Crops</td>
<td>0 + 5</td>
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<td>2</td>
<td>Hybrid Seed Production in Vegetable Crops</td>
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<tr>
<td>3</td>
<td>Commercial Nursery Production Technology for Fruit Crops</td>
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<td>4</td>
<td>Protected Cultivation of Vegetable Crops</td>
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<td>5</td>
<td>Commercial Landscaping and Dry Flower Production</td>
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<td>6</td>
<td>Value Addition and Quality Control in Horticultural Produce</td>
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<td>7</td>
<td>Commercial Production of Bio-Fertilizers</td>
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<td>Commercial Production of Biocontrol Agents</td>
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<td>Mass Media and Communication</td>
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Genetic manipulation and breeding of horticultural crops (0+5)
Syllabus – Practical

Unit I-Genetics


Unit II-Cytogenetics

Principles of microscopy-preparation of fixatives and strains-killing and fixing-study of mitosis and meiosis (squash and smear techniques)-study of pollen morphology and pollen fertility in horticultural crops.

Unit III-Breeding

Gametogenesis and fertilization-study of reproductive structures and pollination mechanisms in horticultural crops- plant breeder’s kit- selfing and crossing techniques-preparation and lay out of experimental plots

Unit IV-Biometrics

study and assessment of variability in population identification of superior genotypes by simple ANOVA- estimation of heterosis in hybrids- recording variations in segregating generations- mutation breeding-physical and chemical mutagens-dosimetry and LD50- maintenance of records and registers – study of A,B and R lines and hybrid seed production-study of wild relatives of horticultural crops.

Unit V-Horticulture

Study of floral biology, pollination mechanisms in major horticultural crops- heterosis breeding and production of hybrids- mutation breeding in horticultural crops- methods of induction of polyploidy-breeding- vegetatively propagated crops- resistance breeding in horticultural crops
Practical schedule

1. Methods of gene symbolization
2. Working out of segregation ratios using checker board and forking method.
3. Significance of chi-square test and goodness of fit with monohybrids.
5. Solving problems with test cross and back cross.
6 and 7. Solving problems with dihybrid ratio.
9. Dominant epistasis(12:3:1) and recessive epistasis(9:3:4).
10. Complementary gene interaction (9:7)
11. Duplicate gene interaction (15:1) and additive gene interaction (9:6:1)
12. Multiple factor hypothesis.
14. Two point test cross.
15. Three point test cross.
17. Drawing linkage maps.
18. Study of cell and cell organelles.
19. Significance of mitosis and meiosis.
22. Preparation of killing and fixing agents.
25 to 30. Study of meiosis in major horticultural crops.
31. Study of gametogenesis and fertilization.
33. Study of pollination mechanisms in horticultural crops.
34 and 35. Study of pollen morphology in different horticultural crops by acetocarmine and Iodine staining.
36 to 40. Practicing selfing and crossing techniques in horticultural crops
41 and 42. Layout of field experiments, RT, RRT, PYT, CYT, MLT and ART.
43. Mid semester Examination
44. Analysis of variance and identification of superior genotypes
45. Working out of first degree statistics
46. Biometrical observations in segregating populations
47. Working out of heritability and genetic advance
48 to 50. Collection of data F1 hybrids parents and estimation of heterosis (di, dii & diii)
51. Maintenance of records and registers (Pedigree record, crossing register and Germplasm cataloguing)
52. Mutagenic treatment in horticultural crops and fixing LD 50 value
53 to 55. Hybrids seeds production techniques in horticultural crops
56. Maintenance of A, B and R lines
57. Identification of wild species in horticultural crops
58 to 65. Study of floral biology and pollination mechanism, practicing selfing and crossing techniques in fruit crops
66 to 70. Study of floral biology and pollination mechanism, practicing selfing and crossing techniques in vegetable crops
71 to 75. Study of floral biology and pollination mechanism, practicing selfing and crossing techniques in flower and medicinal crops
76 and 77. Study of floral biology and pollination mechanism, practicing selfing and crossing techniques in spices and plantation crops
78 and 79. Heterosis breeding in horticultural crops
80 and 81. Mutation breeding in horticultural crops
82 and 83. Ploidy breeding in horticultural crops
84. Resistance breeding in horticultural crops
85. Final Practical examination

REFERENCES

Hybrid seed production in vegetable crops (0+5)

Unit – I – Introduction to seed industry and heterosis

Present status, scope, importance and future prospects of vegetable seed industry. Heterosis – definition, history, achievements, heterosis breeding types - genetic, physiological, biochemical importance of heterosis - exploitation on commercial scale for seed production.

Pollination :

Types, natural cross pollination, extent of it in vegetable crops, factor determining NCP, its role in vegetable seed production, pollination vectors in vegetable crops.

Unit – II – Techniques in hybridization

Hybridization:

Definition, techniques, steps, equipments, use of gametocides in emasculation, methods of pollination – hand pollination, rubbing, hooking, electric bees etc.,

Male sterility and self incompatibility

Devices for hybrid seed production – Genetic male sterility, cytoplasmic male sterility cytoplasmic genetic male sterility – definition, examples, mechanisms, merits and demerits, seed production of CMS, GMS and CGMS lines (A), (B) and (R) line. Self incompatibility- types, genetic control, manipulation, crosses between the parents - single, double cross hybrids, three way back and triple cross etc.,

Unit – III: Practicing in hybrid seed production in important vegetable crops

Land requirement - isolation distance - seedling production - nursery management- planting - maintenance of planting ratio-breeding methods used - rouging- certification - plant protection - seed harvesting extraction - seed drying - processing - methods - grading- seed treatment- packing-labelling-storage-factors affecting storage- seed health management.

Tomato, brinjal, chilli, bhendi

Unit – IV: Practicing in hybrid seed production in important vegetable crops

bitter gourd, pumpkin, snake gourd, ridge gourd, ash gourd, cucumber, watermelon, cowpea, moringa, onion.

**Unit – V: Seed quality control**


**Practical schedule**

1. Present status, scope, importance and future prospects of vegetable seed industry
2. Introduction to heterosis breeding – definition, history and achievements
3. Genetic, physiological, biochemical importance of heterosis
4. Exploitation of heterosis on commercial scale for seed production
5. Types of pollination, natural cross pollination, extent of it in vegetable crops, factor determining NCP, its role in vegetable seed production,
6. Pollination vectors in vegetable crops.
7. Hybridization - definition, techniques, steps, equipments
8. Male sterility –definition and types
9. Genetic male sterility- definition, examples, mechanisms, merits and demerits, seed production of GMS -(A), (B) and (R) line.
10. Cytoplasmic male sterility- definition, examples, mechanisms, merits and demerits, seed production of GMS -(A), (B) and (R) line.
11. Cytoplasmic genetic male sterility- definition, examples, mechanisms, merits and demerits, seed production of GMS -(A), (B) and (R) line.
12. Use of gametocides in emasculation, methods of pollination
13. Hand pollination, rubbing, hooking, electric bees etc.,
14. Self incompatibility- types, genetic control, manipulation
15. Crosses between the parents – single, double cross hybrids, three way back and triple cross etc.,
16. Hybrid seed production in tomato- land requirement, isolation distance -seedling production-nursery management
17. Tomato -planting- maintenance of planting ratio
18. Tomato-Breeding methods used -hand emasculation and pollination
19. Tomato-rouging –certification
20. Tomato-practicing plant protection
21. Tomato-fruit harvesting and seed extraction-seed drying – processing – methods – grading
22. Tomato-seed treatment- packing-labelling-storage-factors affecting storage- seed health management.
23. Hybrid seed production in brinjal -land requirement, isolation distance -seedling production-nursery management
24. Brinjal -planting- maintenance of planting ratio
25. Brinjal -Breeding methods used -hand emasculation and pollination
26. Brinjal -rouging –certification, practicing plant protection
27. Brinjal - Brinjal -fruit harvesting, seed extraction, seed drying, processing, methods – grading-
29. Hybrid seed production in chilli -land requirement, isolation distance -seedling production-nursery management
30. Chilli-planting- maintenance of planting ratio
31. Chilli-Breeding methods used -hand emasculation and pollination
32. Chilli-rouging –certification, practicing plant protection
33. Chilli-fruit harvesting and seed extraction, seed drying – processing – methods – grading
34. Chilli-seed treatment- packing-labelling-storage-factors affecting storage- seed health management.
35. Hybrid seed production in bhendi -land requirement, field preparation, sowing - maintenance of planting ratio
36. Bhendi -Breeding methods used –hand emasculation and pollination
37. Bhendi -rouging –certification, practicing plant protection
38. Bhendi -pod harvesting and seed extraction, seed drying – processing – methods – grading-
40. Hybrid seed production in bitter gourd, snake gourd and ridge gourd-land requirement, field preparation, sowing - maintenance of planting ratio
41. Bitter gourd, snake gourd and ridge gourd -Breeding methods used –hand emasculation and pollination
42. Bitter gourd, snake gourd and ridge gourd -rouging –certification, practicing plant protection
43. Mid term examination
44. Bitter gourd, snake gourd and ridge gourd -pod harvesting and seed extraction, seed drying – processing – methods – grading
45. Bitter gourd, snake gourd and ridge gourd -seed treatment- packing-labelling- storage-factors affecting storage- seed health management.
46. Hybrid seed production in pumpkin and ash gourd-land requirement, field preparation, sowing - maintenance of planting ratio
47. Pumpkin and ash gourd -Breeding methods used –hand emasculation and pollination
48. Pumpkin and ash gourd -rouging –certification, practicing plant protection
49. Pumpkin and ash gourd -pod harvesting and seed extraction, seed drying – processing – methods – grading
50. Pumpkin and ash gourd -seed treatment- packing-labelling-storage-factors affecting storage- seed health management.
51. Hybrid seed production in cucumber and watermelon-land requirement, field preparation- sowing-maintenance of planting ratio
52. Cucumber and watermelon -Breeding methods used -hand emasculation and pollination
53. Cucumber and watermelon -rouging -certification-plant protection
54. Cucumber and watermelon -pod harvesting and seed extraction-seed drying - processing - methods - grading-
55. Cucumber and watermelon -seed treatment- packing-labelling-storage-factors affecting storage- seed health management.
56. Hybrid seed production in cowpea-land requirement, field preparation- sowing-maintenance of planting ratio
57. Cowpea -Breeding methods used -hand emasculation and pollination
58. Cowpea -rouging -certification-plant protection
59. Cowpea -pod harvesting and seed extraction-seed drying - processing - methods - grading-
60. Cowpea -seed treatment- packing-labelling-storage-factors affecting storage-

61. Hybrid seed production in annual moringa -land requirement, field preparation-

62. Annual moringa -Breeding methods used -hand emasculation and pollination
63. Annual moringa -rouging -certification-plant protection
64. Annual moringa -pod harvesting and seed extraction-seed drying - processing - methods - grading-
65. Annual moringa -seed treatment- packing-labelling-storage-factors affecting storage- seed health management.
66. Hybrid seed production in onion-land requirement, field preparation- sowing-

67. Onion -Breeding methods used -hand emasculation and pollination
68. Onion -rouging –certification-plant protection
69. Onion -pod harvesting and seed extraction-seed drying – processing – methods – grading-
70. Onion -seed treatment- packing-labelling-storage-factors affecting storage- seed health management.
71. Visit to seed production plots
72. Visit to national and multinational seed companies
73. Study of maintenance of records and registers including seed processing and seed stock register for the verification of seed inspectors
74. Seed drying methods
75. Study of seed processing and grading
76. Seed treatment, packing, labelling and storage
77. Visit to seed processing unit
78. Calculation of seed production economics
79. Seed certification – phases procedures genetic purity verification
80. Study on certification agency, standards, records and reporting
81. Visit to seed certification department, seed testing lab
82. Seed village - contract farming
83. Seed Act – Rules – seed law enforcement – seed control order – New seed policy
84. Seed quality parameters, seed testing, seed health and test and grow out test
85. Final Practical examination

References
Standard text books


Commercial Nursery Production technology of fruit crops (0+5)

Aim

To impart skill oriented practical knowledge on commercial nursery techniques of fruit plants through experiential learning.

Unit I Media, containers and nursery techniques

Media for propagation - Types of containers – preparation of media - Tools and implements for bed preparation and propagation - Preparation of nursery beds - tray culture - soil sterilization - sowing and maintenance - nutrition – practices - use of plant growth regulators, biofertilizers – pesticides – fungicides for nursery - seed treatments – raising root stocks for propagation of fruit plants - Potting, pot bound condition and repotting of plants

Unit II Propagation structures

Different types of propagation structures - Mist chamber - Shadenet house - phytotron - Polyhouse - greenhouse - Polytunnel nursery and cold frames structures - Hot beds, lath house and pit nursery - ball and bur lapped culture - structures and maintenance for propagation of fruit plants - Economics of construction - Practices - erection of low cost polyhouses

Unit III Methods of propagation – seeds, cutting and layering


Unit IV Grafting and budding techniques

Methods of grafting and budding - Merits and demerits of grafting methods - Selection criteria of root stock and scion – Stock –scion relationship - Bud wood selection and budwood certification and incapability - Anatomical and physiological basis of graft and bud union – Practices - different types of grafting and budding methods – maintenance - Nutrition and plant protection of grafted and budded plants - Visit to commercial fruit plant nurseries - Rejuvenation and top working of fruit plants – practices – top working - Bridge grafting and buttress grafting - Project preparation - establishment of commercial fruit plant nurseries

Unit V Micro propagation
Plant tissue culture laboratory - different types - organization and establishment - basic structural units - stages of micropropagation - Preparation of stock solutions - Plant tissue media preparation - Sterilization and inoculation techniques - shoot tip or Meristem tip culture - Micro grafting techniques in citrus - Tissue culture banana plants - commercial production-meristem culture for induction-proliferation and rooting - Hardening techniques - hill banana production-selection of mother plants- somaclonal variation in tissue culture- potential draw backs and elimination - Project preparation for establishment of plant tissue culture lab

Practical schedule

1. Media – rooting and growing media, rooting media ratio and pH for propagation of fruit plants.
2. Types of containers for propagation of fruit plants
3. Preparation of media for filling containers for fruit plants.
4. Tools and implements for soil working and nursery bed preparation for fruit plants.
6. Visit to industrial units manufacturing containers, tools and implements
7. Preparation of nursery beds, pro tray culture, soil sterilization and sowing and maintenance of nursery beds for propagation of fruit plants
8. Practicing the use of PGRs in nursery for propagation of fruit plants
9. Nursery maintenance and nutrition for propagation of fruit plants
10. Practicing the use of Use of biofertilizers for propagation of fruit plants
11. Practicing the use of Use of pesticides in nursery
12. Practicing the use of Use of fungicides in nursery
13. Seed treatments – raising root stocks for propagation of fruit plants
14. Potting, pot bound condition and repotting of plants
15. Different types of propagation structures of fruit plants
16. Mist chamber – structures – maintenance for propagation of fruit plants
17. Use of mist chamber for seed and vegetative propagation and hardening and maintenance of plants in mist chamber.
18. Economics of construction of mist chamber for propagation of fruit plants
19. Shadenet house, phytotron – structures and maintenance for propagation of fruit plants
20. Polyhouse – structures and maintenance for propagation of fruit plants
21. Economics of construction of shadenet house and polyhouse
22. Types of greenhouse – principles of construction for propagation of fruit plants
23. Uses and maintenance of greenhouses in propagation of fruit plants
24. Economics of construction of greenhouse structures
25. Polytunnel nursery and cold frames for propagation of fruit plants
26. Hot beds, lath house, pit nursery, ball and bur lapped culture for propagation of fruit plants
27. Practicing erection of low cost polyhouses for propagation of fruit plants
29. Asexual methods of propagation
30. Anatomical and physiological basis for rooting
32. Seed propagation techniques and seed treatment of fruit plants
33. Seed dormancy factors, Seed viability, germination, longevity and seedling vigour of fruit plants
34. Factors influencing seed propagation of fruit plants
35. Merits of seed propagation of fruit plants
36. Demerits of seed propagation of fruit plants
37. Nursery techniques – apomixis – polyembryony and principles
38. Practicing leaf and leaf bud cuttings
39. Practicing different types of stem cuttings
40. Practicing and planting of single nodal cuttings and root cuttings.
41. Methods of layering for propagation of fruit plants
42. Practicing different methods of layering.
43. Mid Semester Examination
44. Practicing different methods of layering
45. Maintenance, separation and potting of layers and hardening.
46. Methods of grafting for propagation of fruit plants
47. Methods of grafting for propagation of fruit plants
48. Merits of grafting methods
49. Demerits of grafting methods
50. Selection criteria of root stocks for propagation of fruit plants
51. Selection criteria of scion for propagation of fruit plants
52. Stock–scion relationship and factors influencing stock-scion relationship of fruit plants
53. Bud wood selection and budwood certification and incapability
54. Anatomical and physiological basis of graft and bud union
55. Practicing different types of grafting methods
56. Practicing different types of grafting methods
57. Practicing different types of grafting methods
58. Separation of grafts from mother plants in approach grafting - maintenance of grafted plants in the nursery.
59. Nutrition and plant protection of grafted plants
60. Methods of budding for propagation of fruit plants
61. Practicing different types of budding
62. Practicing different types of budding
63. Maintenance of budded plants.
64. Nutrition and plant protection of budded plants
65. Visit to commercial fruit plant nurseries
66. Visit to commercial fruit plant nurseries
67. Visit to commercial fruit plant nurseries
68. Visit to commercial fruit plant nurseries
69. Rejuvenation and top working of fruit plants
70. Practicing top working of unproductive and old trees
71. Bridge grafting and buttress grafting of fruit plants
72. Project preparation for establishment of commercial fruit plant nurseries
73. Project preparation for establishment of commercial fruit plant nurseries.
74. Plant tissue culture laboratory- organization and establishment- basic structural units, stages of micropropagation
75. Preparation of stock solutions - Plant tissue media preparation.
76. Sterilization and inoculation techniques for general micro propagation
77. Inoculation of shoot tip or Meristem tip culture of fruit crops
78. Micro grafting techniques in citrus for virus free planting material
79. Production of tissue culture banana plants- media for shoot tip culture
80. Banana-commercial production-meristem culture for induction-proliferation and rooting
81. Hardening techniques-commercial hardening methods- primary and secondary hardening
82. Scale up studies for hill banana production-selection of mother plants- ELISA and its uses for disease elimination
83. Assessment and identification of somaclonal variation in tissue culture-potential draw backs and elimination
84. Project preparation for establishment of plant tissue culture lab
85. Final practical Examination

References


Further readings

e-references
http://www.horticulture/propagation.com
http://www.fruitcrops.propagation.com
http://www.micropropagation/propagationtechniques.com
http://www.biotech/tissue culture techniques.com
http://www.Biotech/horticultural crops.com

Journals
1. India J. Hort.
5. J.Ornamental Hort.
6. Floriculture Today
9. Plant cell rep.

Outcome
Students will gain practical knowledge and hands on experience in the all the aspects of nursery production and micropropagation of fruit plants

Protected cultivation of vegetable crops (0 + 5)

Unit – I: Overview of protected cultivation and green house structures

Profiles of crop production systems - Hi - tech culture- overview – global scenario of protected cultivation of vegetable crops - scope of hi-tech culture in India, Tamil Nadu for vegetable crops - export potentials of vegetable crops grown in green house in India and Tamil Nadu – Off-season production of vegetable crops.

Study of greenhouse type - based on shape, construction, covering materials, utility - greenhouse benches - design of the fan and pad cooling system. Design and lay out of protected structures – green house, glass house, polyhouse, poly tunnels, shadenet, portable greenhouses, mist chamber and working out the cost of establishment.
Unit – II: Nursery production and environmental control
Nursery production system - ball culture - automatic filling and planting systems
nutrient management and irrigation systems – plant protection – transport of seedlings
- study of environmental control systems –light, temperature, humidity, oxygen,
carbon – dioxide and ethylene - study of climate walls, roofing materials, fogging
systems, ventilation systems –cooling systems- heating system for protected structures.

Unit – III: Greenhouse media, irrigation systems and fertigation
Root media – properties- components- soil mixing systems – soil less culture -
NFT, hydroponics, aeroponics - Soil testing - visual diagnosis and corrective procedures
- media for hi-tech vegetable culture – preparation of beds – media sterilization-
irrigation systems - fertigation, water soluble fertilizers and micro fertilizer mixtures.

Unit – IV: Greenhouse production technology for vegetable crops
Varieties and hybrids suitable for protected cultivation- seed rate- containerized
transplant production - field preparation inside protected structures - spacing- planting
systems- irrigation- mulching-special cultural practices- pruning, pinching, training,
trellising-pollination-nutrient requirement- fertigation- nutrient deficiency-
physiological disorders and corrective measures – role of growth regulators – plant
protection –study of constraints in protected cultivation- harvest- yield- post harvest
handling -export standards – storage and marketing of tomato, capsicum and paprika.
Visit to commercial vegetable growing protected structures and project
preparation for the establishment of commercial units for the above crops

Unit – V: Greenhouse production technology for vegetable crops
Varieties and hybrids suitable for protected cultivation- climate and soil
requirements- seed rate- containerized transplant production - field preparation inside
protected structure - spacing- planting systems- irrigation- mulching-special cultural
practices- pruning, pinching, training, pollination-nutrient requirement- fertigation-
nutrient deficiency- physiological disorders and corrective measures – role of growth

Visit to commercial vegetable growing protected structures and project preparation for the establishment of commercial units for the above crops.

**Practical schedule**

1. Profiles of crop production systems of horticultural crops
2. Hi-tech culture – overview – global scenario of protected cultivation of vegetable crops
3. Scope of hi-tech culture in India and Tamil Nadu for vegetable crops
4. Export potentials of horticultural crops grown in green house in India and Tamil Nadu
5. Off-season production of vegetable crops – means and techniques
6. Study of greenhouse type based on shape and construction
7. Study of greenhouse type based on covering materials
8. Study of greenhouse type based on utility
9. Study of greenhouse components – benches, design of the fan and pad cooling system
10. Design and lay out of green house
11. Design and lay out of poly house
12. Design and lay out of glass house
13. Design and lay out of poly tunnels and mist chamber
14. Design and lay out of shade net
15. Working out the cost of establishment of green house, glass house
16. Working out the cost of establishment poly house
17. Working out the cost of establishment poly tunnels, mist chamber and shadenet
18. Practicing containerized nursery production system
19. Practicing automatic filling and planting systems
20. Practicing nutrient management and irrigation systems for containerized transplant production
21. Practicing plant protection measures in containerized nursery production system and transport of seedlings
22. Study of environmental control systems - light and temperature
23. Study of environmental control systems - humidity, oxygen, carbon dioxide and ethylene
24. Study of climate walls inside the greenhouse
25. Study of roofing materials for greenhouse
26. Study of fogging systems for greenhouse
27. Study of ventilation systems for greenhouse
28. Management of Greenhouse summer cooling systems
29. Management of Greenhouse winter cooling systems
30. Study on the properties and components of a root medium for greenhouse
31. Preparation of root media for protected cultivation
32. Media sterilization
33. Study of Nutrient Film Technique
34. Study of hydroponics and aeroponics
35. Soil testing for greenhouse crops
36. Preparation of beds inside the greenhouse
37. Irrigation systems for greenhouse
38. Fertigation, water soluble fertilizers and micro fertilizer mixtures
39. Visual diagnosis and corrective procedures for greenhouse crops
40. Selection, identification and description of cultivars suitable for protected cultivation of tomato
41. Sowing of seeds under containerized transplant production for tomato
42. Bed preparation and transplanting of tomato
43. Mid Semester examination
44. Irrigation management systems inside the protected structures
45. Practicing mulching, training, pruning, trellising in tomato
46. Scheduling of nutrients for tomato through drip fertigation
47. Identification of nutrient deficiencies – physiological disorders and corrective measures and growth regulator application
48. Study of plant protection measures in tomato under protected conditions
49. Study of constraints of tomato under protected cultivation
50. Harvest indices and maturity standards and post harvest handling of tomato
51. Exports standards – storage and marketing of tomato
52. Visit to commercial tomato growing units under protected structures
53. Project preparation for the establishment of commercial units for tomato
54. Selection, identification and description of cultivars suitable for protected cultivation of capsicum and paprika
55. Sowing of seeds under containerized transplant production for capsicum and paprika
56. Bed preparation and transplanting of capsicum and paprika
57. Irrigation management systems inside protected structures
58. Practicing mulching, training, pruning, trellising in capsicum and paprika
59. Scheduling of nutrients for capsicum and paprika through drip fertigation
60. Identification of nutrient deficiencies – physiological disorders and corrective measures and growth regulator application
61. Study of plant protection measures in capsicum and paprika under protected conditions
62. Study of constraints of capsicum and paprika under protected cultivation
63. Harvest indices and maturity standards and post harvest handling of capsicum and paprika
64. Exports standards – storage and marketing of capsicum and paprika
65. Visit to commercial capsicum and paprika growing units under protected structures
66. Project preparation for the establishment of commercial units for capsicum and paprika
67. Selection, identification and description of cultivars suitable for protected cultivation of cucumber and melons
68. Sowing of seeds under containerized transplant production for cucumber and melons
69. Bed preparation and transplanting of cucumber and melons
70. Irrigation management systems inside protected structures
71. Practicing mulching, training, pruning, trellising in cucumber and melons
72. Scheduling of nutrients for cucumber and melons through drip fertigation
73. Identification of nutrient deficiencies - physiological disorders and corrective measures and growth regulator application
74. Study of plant protection measures in cucumber and melons under protected conditions
75. Study of constraints of cucumber and melons under protected cultivation
76. Harvest indices and maturity standards and post harvest handling of cucumber and melons
77. Exports standards - storage and marketing of capsicum and paprika
78. Project preparation for the establishment of commercial units for cucumber and melons
79. Sowing seeds of leafy type coriander under protected condition
80. Practicing thinning and gap filling in coriander
81. Practicing irrigation management and fertigation in coriander
82. Practicing plant protection measures for coriander
83. Harvesting, postharvest handling and marketing in coriander
84. Visit to commercial markets to study the feasibility
85. Final Practical examination

References
5. Robert, A. Aldrich and John W. Bantok. 1990 Greenhouse Engineering. Ball publishing, USA.

Further Readings

Journals:

• Vegetable sciences
• Acta Horticulture
• Indian Journal of Horticulture
• Asian Journal of Horticulture
• Indian Horticulture
Progressive Horticulture

e – references

http://www.informaworld.com/smpp/title~db=all~content=g904622674
http://www.ces.ncsu.edu/depts/hort/hil/hil-32-a.html
http://attra.ncat.org/attra-pub/manures.html
http://ucanr.org/freepubs/docs/8129.pdf
http://www.agnet.org/library/eb/545/
http://www.sus-veg-thai.de/
http://www.amazon.co.uk/Vegetable-Alliums-Production-Science-Horticulture/dp/0851987532
Commercial Landscaping and Dry Flower production (0+5)

Unit – I

Identification of ornamentals


Unit – II

Garden Types

- Planning, designing and execution of home garden, institutional garden, public garden, corporate garden and factory garden. Role of CAD on landscaping - Planning, designing and execution of rock garden, roof garden, water garden/lily ponds, vertical garden, dish garden / terrariums.

Unit III

Designing garden components


Unit – IV

Bonsai and Turf


- Turf - Introduction – scope, importance and value of turfs in landscape industry - turf grass – species and types – criteria for selection of turf grass – site selection and

Unit – V

Dry flower production and arrangements


Practical schedule

1-2 Identification, description and propagation of ornamental tree species
3-4 Identification, description and propagation of annuals
5-7 Identification, description and propagation of ornamental shrubs of ornamental shrubs
8-9 Identification, description and propagation of ornamental herbaceous perennials
10-11 Identification, description and propagation of climbers and creepers
12-13 Identification, description and propagation of palms and cycads
14-15 Identification, description and propagation of grasses, ferns and selaginellas
16-17 Visit to ornamental commercial nurseries
18 Planning, designing and execution of home garden
19-20 Planning, designing and execution of institutional garden
21-22 Planning, designing and execution of public garden
23-24 Planning and designing of corporate and factory garden
25-26 Role of CAD on landscape components
27-28 Planning, designing and execution of rock garden
29-30 Planning, designing and execution of roof garden
31-32 Planning, designing and execution of water garden/lily ponds
33-34 Planning, designing and execution of vertical garden
35-36 Planning, designing and execution of dish garden and terrariums
37-38 Planning, designing and execution of hedges
39-40 Planning, designing and execution of edges
41-42 Planning, designing and preparation of flower beds / carpet beds
43 Mid – Semester
44-45 Planning, designing and execution of topiary
46-47 Planning, designing and execution of trophy
48-49 Planning, designing and preparation of hanging baskets
50-51 Planting, training and pruning of climbers over arches, pergolas and arbors
52 Pot mixture preparation, Potting and repotting
53-54 visit to corporate and industrial landscapes
55-61 Bonsai - Identification and collection of suitable planting materials
   - Tools, containers and preparation of media - Styles, designing and making of bonsai - Training and pruning techniques in bonsai - Irrigation, manuring, pest and disease maintenance
72-79 Dry flower - Identification and collection of planting materials - Method of drying – Air drying - Water drying - Embedding (Sand, Silica gel and Borax) - Oven drying - Immersion and skeletonizing - Bleaching of dry flower - Dyeing of dry flower - Preservation, fumigation and storage of dry flowers - Craft making and table top arrangements
80-84 Flower arrangement - preparation of bouquet, wall hangers, wreath
and cones - Potpourri - wet and dry method - Preparation of greeting cards - Trimming, glue painting and ribbon fixing - Packaging and transport - Visit to dry flower industry - Visit to plant quarantine centre

85 Final Practical Examination

Text Books


Further readings


Journals

1. J. Orn. Hort. Indian Society of Ornamental Horticulture, Division of
Floriculture and Landscaping, Indian Agricultural Research Institute, New Delhi, India.

2. Floraculture International. P.O.Box 82, 1850 AB Heiloo, The Netherlands.


e – references

1. www.bestgarden.net
2. www.centralfloridagarden.blogspot.com
3. www.intuxford.tripod.com
4. www.lawngrasses.com
5. www.personal.psu.edu
6. www.sunny.crk.umn.edu/courses
7. www.webct.uark.edu
Value addition, quality control in horticultural produce (0+5)

AIM
To impart knowledge on preservation technology, preparation of value added products and quality control.

PRACTICAL

Equipment used in food processing unit, preparation of beverages – Squash, RTS, Nectar, Cordial, Crush, Syrup, Wine and juice concentrate, preservation with sugar – Jam, Jelly, Marmalade, Candy, Preserve, Glazed candies and Crystallized fruits, preservation with salt & vinegar – Pickle, Chutney, Sauce - dehydration of horticultural produces, by products from waste – freezing of fruit and vegetables, canning of fruit and vegetables – value added product from spices, preparation of herbal drinks – quality control of value added products – quality analysis of horticultural produces - visit to food processing industries, spice and coffee board.

PRACTICAL SCHEDULE

1. Equipment used in food processing unit.
2. Preparation of Squash.
3. Preparation of RTS.
4. Preparation of Nectar.
5. Preparation of Cordial.
6. Preparation of Crush.
7. Preparation of Syrups.
8-10 Preparation of Wine.
11. Preparation of juice concentrate.
12. Preparation of Jam.
20-23. Preparation of Preserve.
29-33. Preparation of Crystallized fruits.
34. Preparation of Pickle.
35. Preparation of Chutney.
36. Preparation of Sauce/Ketchup.
37. Dehydration of fruits.
38. Dehydration of vegetables.
41&42. Development of fruit juice powders.
43. Mid semester Examination
44&45. Osmotic dehydration of fruits.
46&47. Preparation of resins.
48. Preparation of desiccated coconut.
49. Preparation of pectin from peel waste.
50. Developing products from fruit waste.
51. Developing of flour from mango kernels.
52. Extraction of natural food colour from grape skins.
53. Freezing of fruits.
54. Freezing of vegetables.
55. Canning of fruits.
56. Canning of vegetables.
57. Preparation of pepper products.
58. Developing of herbal drinks.
59. Determination of TSS.
60. Determination of moisture.
61. Determination of acidity.
62. Determination of pH.
63. Firmness of fruits.
64. Estimation of Vitamin C.
65. Estimation of reducing sugar.
66. Estimation of Total sugar.
67. Determination of total of pectin.
68. Determination of beta carotene.
69. Determination of chlorophyll.
70. Determination of Anthocyanin
71. Determination of Lycopene.
72. Estimation of protein.
73. Assay the non enzymatic browning of products.
74. Estimation of Ash.
75. Estimation of Calcium.
76. Estimation of phosphorous.
77. Estimation of Iron.
78. Estimation of crude fibre.
79. Estimation of tannins.
80. Sensory evaluation for fruit and vegetable products.
81. Visit to the processing units.
82. Visit to the commercial caning units.
83. Visit to coffee board.
84. Visit to Spice board.
85. Final Practical Examination

Text books

2. Vijay sethi, shruti sethi, B.C. Deka and Y.R Meena, 2005. Processing of fruits and
Further reading


E – References

http://www.fao.org/DOCKEP/005 Y4358E/Y4358e04.htm
http://home.att.net/~africantech/GhIE/QPLFood.htm

Journals

1. Indian food packer
2. Processed Food Industry
COMMERCIAL PRODUCTION OF BIOFERTILIZERS (0 + 5)

Unit I

Introduction – Historical development – Types of Biofertilizers - Importance of biofertilizers in integrated nutrient management – sources of biofertilizer – bacteria, fungi, actinomycetes, Plant-microbe interaction-Rhizosphere, Phyllosphere and spermosphere microbiology, beneficial and harmful relationship microscopy- principles and types of microscopes – resol, staining techniques, union- magnification, sterilization, principles and equipments- morphology and growth characteristics of microorganisms

Unit II


Unit III

P mobilizing microorganisms - ecto & endomycorrhiza. Importance of mycorrhizal fungi in horticulture-Orchid & ericoid mycorrhiza colonization, Biofertilizers for K nutrition – mechanism- K- solubilizing microorganism, Biofertilizers for Zinc and sulphur - mechanism - Zinc and sulphur solubilizing microorganism - screening of efficient strain for mass production, Biofertilizer production – Fermentation – fermenter types and operation-downstream processing

Unit IV


Practical

1. Introduction and historical developments
2. Types and importance of biofertilizers in horticultural crops
3. Role of biofertilizers in integrated nutrient management
4. Sources of biofertilizer – bacteria, fungi, actinomycetes
5. Microbial interrelationship in soil – Rhizosphere- R:S ratio
6. Rhizosphere, Phyllosphere and spermosphere microbiology
7. Determination of R:S ratio
8. Distribution and importance of microorganisms
9. Beneficial and harmful relationship
10. Microscopy- principles – resolution- magnification
11. Different types microscope
12. Sterilization, principles and equipments
13. Staining techniques
14. Simple and differential staining
15. Study of morphology of bacteria
16. Examination of Growth curve in bacteria
17. Study of morphology and growth characteristics of fungi and actinomycetes
18. Factors influencing growth of microorganisms
19. Nutritional requirements in bacteria, fungi and actinomycetes biofertilizers
20. Media preparation for bacteria, fungi and actinomycetes biofertilizers
21. Methods for isolation of bacteria, fungi and actinomycetes biofertilizers
22. Purification and preservation methods of bacteria, fungi and actinomycetes
23. Nitrogen cycle
24. Biological nitrogen fixation – symbiotic, associative, non symbiotic
25. Biochemistry of nitrogen fixation
27. Rhizobium – cross inoculation group – nodulation process
28. Isolation and characterization, screening of Azotobacter
29. Isolation and characterization, screening of Azolla
30. Isolation and characterization, screening of Cyanobacteria
31. Frankia - biofertilizer
32. Isolation and characterization, screening of Frankia
33. Bacterial and fungal endophytes
34. Isolation and characterization screening of Gluconoacetobacter
35. PGPR microorganisms types mechanisms of plant growth promotion
36. PGPR- isolation, characterization, screening
37. Screening of efficient nitrogen fixers and strain selection for mass production
38. Phosphorus cycle
39. Biofertilizers for P nutrition
40. P solubilizing microorganism – mechanism
41. P mobilizing microorganism - Mycorrizal fungi
42. Importance of mycorrizal fungi in horticulture
43. Mid-semester examination
44. Ectomycorrizha – colonization – role in nutrient tranformation
45. Endomycorriza – AM fungi- colonization
46. Orchid & ericoid mycorrhiza colonization
47. Screening of mycorrizha fungi for host preference
48. Biofertilizers for K nutrition – mechanism
49. K- solubilizing microorganism – isolation and Characterization, screening
50. Screening of efficient K-solubilizers and strain selection for mass production
51. Sulfur cycle
52. Biofertilizers for Zinc and sulphur - mechanism
53. Isolation and characterization of Zinc and sulphur solubilizing microorganism
54. Screening of efficient Zinc and sulphur solubilizers and strain selection for mass production
55. Principles of fermentation process- types of fermentor
56. Fermentor operation and maintenance
57. Downstream processing
58. Strain improvement
59. Strain selection for inoculants production
60. Mass multiplication of Rhizobium
61. Mass multiplication of Azospirillum
62. Mass multiplication of Azotobacter
63. Mass multiplication of Gluconoacetobacter
64. Mass multiplication of Azolla and cyanobacteria
65. Mass multiplication of Frankia
66. Mass multiplication of Phosphobacteria
67. Mass multiplication of AM fungi
68. Mass multiplication of Ectomycorriza
69. Mass multiplication of K solubilizers
70. Mass multiplication of Zinc and sulphur solubilizers
71. Selection and processing of bacterial biofertilizers
72. Selection and processing of fungal biofertilizers
73. Preparation of carrier based bacterial inoculants
74. Preparation of carrier based fungal inoculants
75. Quality control and Bis specifications for different biofertilizers
76. Demand and marketing
77. Newer formulations of different biofertilizers
78. Storage methods
79. Bacterial biofertilizers application methods
80. Fungal and actinomycetes biofertilizers application methods
81. Economics of biofertilizers application- constrains in production
82. Application of biofertilizers for horticultural crop – fruits, vegetables
83. Application of biofertilizers for horticultural crop – Spices and plantation crops
84. Visit to commercial biofertilizer production unit
85. Final Practical Examination

References
COMMUNICATION MEDIA (0+5)

Syllabus

Preparation and practicing of traditional media - Leaf lets – Pamphlets – Folders – Booklets

Understanding the Newspaper - News Story - Success Story - Feature Story

Preparation of Newsletter – Magazine – Powerpoint presentation and multimedia presentation

Practicing - Photoshop – web designing and understanding web hosting

Knowledge on e-Velanmai – agritech portal – e-Arik –a-AQUA – social networking – mobile usage – DMI – Kissan Call Centre

Practicing radio – video recording – photography –field publicity methods like posters, charts-graphs.

Understanding the media usage by stakeholders

Lecture Schedule

1. Preparation of Leaf lets
2. Practice in preparation of Leaf lets
3. Practice in preparation of Leaf lets
4. Preparation of Pamphlets
5. Practice in preparation of Pamphlets
6. Practice in preparation of Pamphlets
7. Preparation of Folders
8. Practice in preparation of Folders
9. Preparation of Booklets
10. Visit to TNAU Press
11. Preparation of News Story
12. Practice in preparation of News Story
13. Preparation of Success Story
14. Practice in preparation of Success Story
15. Practice in preparation of Success Story
16. Preparation of Feature Story
17. Practice in preparation of Feature Story
18. Practice in preparation of Feature Story
19. Visit to Newspaper Press
20. Preparation of Newsletter
21. Practice in preparation of Newsletter
22. Practice in preparation of Newsletter
23. Preparation of Magazine
24. Practice in preparation of Magazine
25. Practice in preparation of Magazine
26. Preparation of Power Point Presentation
27. Preparation of Power Point Presentation
28. Animation in powerpoint presentation
29. Preparation of Multi Media Presentation
30. Practice in preparation of Multi Media Presentation
31. Practice in preparation of Multi Media Presentation
32. Practicing Photoshop
33. Practicing Photoshop
34. Web Designing
35. Web Designing
36. Web hosting
37. Concept and development of e-velanmai
38. Functioning of e-velanmai
39. Functioning of e-velanmai
40. www.agritechprotal.com
41. Horticulture under www.agritechprotal.com
42. Allied aspects on www.agritechprotal.com
43. Extension through www.agritechprotal.com
44. Mid semester examination
45. Learning e-ARIK.a-AQUA, DACNET
46. Learning of digital extension activities in India
47. Learning of digital extension activities in the world
48. Social networking methods
49. Social networking methods
50. Use of Mobile for extension Indian and International experiences
51. Dynamic Market Information (DMI)
52. Dynamic Market Information (DMI)
53. Kissan Call Centre
54. Use of Radio in extension
55. Preparation of Radio Script
56. Visit to Community Radio Station
57. Visit to AIR, Madurai
58. Preparation of Video Script
59. Video recording
60. Video editing
61. Sound mixing
62. Visit to educational media centre
63. Agriculture programmes in Various TV Channels
64. Photography
65. Practice in Photography
66. Practice in Photography
67. Photo journalism
68. Practicing digital photo editing
69. Practicing digital photo editing
70. Sharing of photos and videos over the internet
71. Practice on Field Publicity Method – Posters
72. Practice on Field Publicity Method – Posters
73. Digital printing of posters
74. Practice on Field Publicity Method – Charts
75. Practice on Field Publicity Method – Graphs
76. Practice on Field Publicity Method – Graphs
77. Practice on Field Publicity Method – Graphs
78. Preparation of models
79. Preparation of models and collection of specimens
80. Use of bulletin boards
81. Media usage by the Department of Horticulture
82. Media usage by the University
83. Media usage by KVKs
84. Media usage by NGOs
85. Final practical examination

Reference

Textbooks

Website
www.agritechportal.com
www.i4d.com